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SUCCESS IN FARMING.

A SERIES OF

PRACTICAL TALKS

WITH FARMERS.

BY

WALDO F. BROWN.

SECOND EDITION.

PUBLISHED BY

R. S. THOMPSON,

SPRINGFIELD, O.

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DEDICATION.

To my friend, S. H. Ellis, who is not only a successful farmer, but whose words and influence have stimulated thousands of farmers in their efforts to achieve true success, this book is respectfully dedicated.

WALDO F. BROWN.

27857

PUBLISHER'S PREFACE.

It has given me pleasure to be able to present this book to the Agriculturists of this country. I have seen the great need of some practical book suited to practical farmers in our central and western states.

The majority of the agricultural books that have heretofore been published, have been designed for the few who already have made the business a matter of scientific study, rather than for the many who have been deprived of these advantages.

In looking about for a man who should write this book, which I intended should be the book for the people, I could think of no person more suited for the task than my friend and co-laborer, Waldo F. Brown.

He has had a long, practical experience on the farm. Unaided by rich friends or college preparation, he has had to fight his own way through life. He has met the difficulties that beset the farmer, and has learned by experience just what are the needs of his brother farmers and can talk to them in their own way.

Probably of all the agricultural writers of the country there are none who have a higher reputation for plain, practical writing, than Mr. Brown.

The manuscript of the book I have carefully read, and in places have added as foot notes, points I thought had been omitted, or on which I disagreed. I send the book out to the world, hoping that it may lead many of our people to not only greater success in farming, but also to greater success in living.

R. S. Thompson, Publisher.

INTRODUCTION.

For nine years I have been constantly before the public as a writer, having in that time written more than a thousand articles for the Agricultural Press. The kind reception which has been given to these articles, whether appearing over my own name or any of those with which I have at times concealed my identity, such as "Waldo," "Odlaw," "Agricola," "Solomon Smith," "Squire Bung," &c., has led me to believe that some of my thoughts and experiences, in more systematic order and in a form better suited for preservation, would be welcomed by many.

During seven years past I have been much in the field as an agricultural lecturer at fairs and farmers' picnics, and have been gratified by learning from many of those I met, that my articles have often proved helpful to them in overcoming the difficulties that beset the farmers and aiding them to greater success in the management of their farms. All my mature life having been spent upon the farm, and believing as I do that the life of a farmer gives full scope for the best powers of the best men, I have no higher ambition and ask no greater reward, than to be able to help my co-laborers to attain "Success in Farming."

WALDO F. BROWN,
East View Farm,
Oxford, Ohio.

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SUCCESS IN FARMING.

CHAPTER I.

WHAT CONSTITUTES SUCCESS UPON THE FARM.

That Peter Poverty is a miserable failure as a farmer, requires no argument to show, for a glance reveals it. There is a general appearance of "run-down-ness" about his premises. His buildings, stock and crops, show that the expressive Yankee adjective "shiftless" fits him. Let us be thankful that he is not as "numerous" as formerly, and that his children are not likely to follow his calling. We will pass him by after mentioning his greatest value. He is a splendid example of "how not to do it."

Let me next introduce you to Sam Skinsoil. He is an enterprising man with a strong head of steam, and as much business to the square inch as a railroad contractor. He has made money, too, but he has taken the cream off from a half score of farms during a third of a century. His plan has been to rent a farm for two or three years, plow every available foot of it, get all he

could from the soil and return nothing. Or he would buy a farm, cut off all the timber, reduce its fertility, and then sell and move on. He can be tracked as easily as a hurricane. He, likewise, is not a success, and we can pass on.

William Wealthy is the next neighbor. He has six hundred acres of land, all in a high state of cultivation, his stock is well bred and well fed, his land productive, and buildings commodious. This begins to look like success, but before you pronounce it such let me give you his history:

He is seventy years old, and although you can see at a glance that there is no necessity for it, he works harder than any day laborer in his employ. Money making has become a passion with him. He has not been a hundred miles away in twenty years. His home is destitute of books, and he takes but one paper and that a violent partizan sheet, the organ of his party. Agricultural books and papers he despises. A flower is to him a weed, and he is like Holland's "Old Daniel Gray," who "could see naught but vanity in beauty, and only weakness in a fond caress."

He has become merely an automaton, good only for the money he can make. His wife is working as hard as himself, and has long since given up trying to cultivate flowers, although there was a time when she loved and admired them. They board the farm hands because it is cheaper (?) than to hire men who board themselves. If called upon to write his epitaph, and I wished to tell the truth, it would be something like this:

"Here lies a man who toiled from morn till eve that he might make money, with which to buy more land, on which he might work to make more money to buy more land. As his acres broadened his mind and soul narrowed, and the world was none the better for his having lived."

I once heard an impressive sermon on the subject of Lot pitching his tent towards Sodom. The farmer who has no higher idea of life than to make money, may not like Lot loose his property, but he will loose all that makes life valuable.

I do not recommend idleness; the farmer must be a worker; his crops must be good, and the fertility of the farm maintained or increased. He must be a business man, able to give a reason for what he does; he must read and think and by intelligent forethought make himself master of his farm and business and not become its slave. He should also be public spirited and ready to do his part in advancing the welfare of the community.

To make a home for the family where they may be happy and contented; to rear the children to industry and yet teach them that mind and soul, not dollars and cents, give worth to man, and to so manage the farm that it shall supply all their wants constitutes "success in farming."

CHAPTER II.

SELECTION OF THE FARM.

There are many important matters to be considered in the selection of the farm which is to furnish its owner a livelihood and his family a home.

First of all the farm must be suited to his means. Nothing more cramps and hinders a farmer than lack of capital or a debt hanging over him. My advice would be to buy a smaller farm which, when paid for, would leave some cash working capital, rather than a larger one which involves the buyer heavily in debt.

The farmer who at the close of the year, after having sold his crops has cash on hand to meet the expenses of the coming year, works at an immense advantage over the man who must use this money in meeting debts and start empty handed on another year's labor.

I do not mean to say that a farmer is never, under any circumstances, justified in going into debt, but what I do say is that a farmer who can pay for a farm of one hundred acres and have money enough left to stock and operate it, is unwise to purchase a two hundred acre farm and have for years a debt hanging over him.

More farmers to-day are being made dissatisfied with their calling, and hindered in their efforts at advancement by the burden of debt, than by all other causes combined.

SIZE OF THE FARM.

Both large and small farms have their advantages,—and which is more desirable in any particular case must

be determined by two things:—the farmer's means, and his business capacity.

A large farm will justify the purchase of more labor-saving machinery, and enable the farmer to keep this machinery more fully engaged, more help can be permanently employed and is thus at command when needed in an emergency.

A large farm furnishes larger scope for business management and executive ability. The farmer is less dependent for his profits on his individual labor and more on his capacity to wisely direct the labor of others. The successful manager of a large farm really becomes the executive head of a business establishment.

A large farm affords greater facilities for diversified farming; for maintaining the fertility of the soil by rotation of crops and green manuring, and is adapted to stock raising, which is less laborious than where a large proportion of the income must be derived from the cultivation of the soil.

On a large farm the amount of fencing in proportion to the number of acres can be greatly reduced as larger fields can be used, and thus one heavy item of investment and continued expense be lessened.

The man on a small farm can largely dispense with hired labor, and thus avoid the trouble connected with managing the labor of others.

His expenses being comparatively small, his risk of loss from failure of crops or other causes is also smaller.

The number of acres being small, and every part of it being directly under his own eye, he can more readily secure thorough cultivation—which means larger yield per acre and less cost per bushel.

ADAPTATION TO PURPOSE DESIRED.

The farm should be adapted to that particular branch

of agriculture with which the farmer is most familiar, and which he intends to follow—but as this will be discussed in another chapter I will not consider it further here.

CONDITION OF SOIL.

Although a rich and productive soil is always desirable, yet there are circumstances under which a run-down farm may profitably be purchased.

In considering this matter, the first thing to be looked at is the cause of the want of fertility. If the farm is a rolling one and the lack arises from washing; or if the soil is thin and leachy, there are no circumstances which would justify a man in making the purchase.

There are however many run-down farms the fertility of which can be restored and which can be bought at so low a price that they will prove a better investment than a fertile farm at the price at which it can be obtained.

If the soil was originally strong and retentive, especially if it were a heavy clay, and the fertility has been exhausted simply by excessive cropping without rotation or manuring, a judicious system of rotation, green manures, the careful saving and applying of all home fertilizers with perhaps a reasonable expenditure in commercial fertilizers, will fully restore its fertility.

Of course due caution should be used in so important a matter, but if one is sure that the fertility of the soil can be fully restored, he can often obtain a good farm in this manner at less cost, and will moreover be entitled to be regarded as a public benefactor.

HEALTHFULNESS.

A healthy location is important. Many a farmer, attracted by a fertile soil and low price, has settled on the border of a swamp or in some region infected with

malaria, and has had all the energy shaken out of him by chills and fever, or his profits eaten up by doctor's bills and quinine.

WATER.

Water supply both for family and stock should be carefully considered. The supply should be wholesome, unfailing and convenient. There are large districts of level lands in many of our States, where in a wet season the wells fill to the surface, and the water becomes contaminated and unwholesome, while in a dry season they fail entirely. Careful inquiry on this matter should be made not only of the man from whom you expect to purchase, but also from disinterested parties well acquainted with the locality.

ROADS AND CONVENIENCES TO MARKET

Are important considerations, and on them both the comfort and profit of the farmer largely depend.

The farmer on a good free pike, within two or three miles of a railroad station, can with a good team take to market from two hundred to three hundred bushels of grain in a day. If ten miles away, on a hilly mud road it is often a hard day's work to market forty bushels. There will not be a day in the year in which the former cannot go comfortably to postoffice or market, while the latter will, in open winters, be mud-bound for weeks or months.

SCHOOLS AND CHURCHES.

Convenience of the farm to these should also be considered, for if distant and difficult to reach, the wife and children will often be deprived of privileges which are of inestimable value.

COMMUNITY.

The character of the community should be carefully considered before a man decides to become a member of

it. No consideration should induce him to settle in a neighborhood where the Sabbath was disregarded or the inhabitants known to be lawless and immoral. There should also be a certain amount of public spirit among the people so that highways will be kept in repair and other measures for the public good supported.

All these considerations and others which may occur to the reader, should be borne in mind in the "selection of the farm."

CHAPTER III.

MANAGEMENT.

Having bought the farm, next comes the question of management; and here is where many fail. It does not necessarily follow because your neighbor has made money from some specialty in farming that you, on a different farm, can successfully imitate him.

My own neighborhood will illustrate this question of adaptation of crops or stock to the farm. One mile east of me there is a tier of farms mainly rich bottom land. The soil on these produces crops of corn with a rotation which once in four or five years brings them into clover. The farmers who have patiently followed producing hogs and corn on these farms have grown rich, and at the same time kept their lands fertile. On either side of these is a tier of broken farms. The drainage from the farms still further back has cut channels to the main stream until at intervals varying from thirty to eighty rods, are deep ravines coming down through these farms. This makes them liable to wash, for the land has not only a general slope to the main stream, but a lateral slope towards these ravines. My farm is in the next tier, and is back far enough so as not to be cut by the ravines and is generally level although with fall enough to drain it. A few miles west of where I live, is a strip of rich black land which was originally swamp but which has been thoroughly drained and improved. All these farms call for different management, and yet many of the farmers have not found it out, but because farmer

A on the bottom has made money by corn and hogs, farmer B on the farm adjoining has run his ridges in corn until he has soil scattered all the way to the Gulf of Mexico.

These bottom farms are the place for hogs and Short-Horn cattle. The farms adjoining them should be stocked with sheep or run as dairy farms with small cattle like the Jerseys. The next tier or two gives us our best wheat land, and are well adapted to mixed farming, as corn, grass and potatoes do well on them. Over in the drained swamps is the profitable barley land, and as barley land is also good corn land, here again mixed farming is best.

These black lands, as well as the bottoms will grow fine Early Rose or other early varieties of potatoes; but Peachblows and other late maturing varieties and sweet potatoes are often a failure on them, while on a stiff cold clay the Peachblow and sweet potato produce—with a little manure—good crops of fine quality. We have also land that produces with certainty good crops of wheat when plowed shallow or prepared by cultivating and pulverizing three inches of the surface without breaking but on which it often fails when deeply plowed.

Here and there are farms with a warm soil well suited to broom corn growing, and because their owners make money on the crop, some one with a cold stiff clay attempts to grow it, and with more than double labor produces a half crop of an inferior article.

I have spoken of these farms to illustrate an important truth, namely, that success in farming depends largely on intelligence in management, and in adapting our products to the soil and circumstances surrounding us.

Numbers of farmers fail because they do not put

thought into their business; they have no settled policy and are not at all certain that the plan they are following—if indeed they can be said to have a plan—is the best for them. As Peter exhorts Christians to be always ready to give "a reason for the hope in them," so should every farmer be ready to give a reason for the plan he is following.

There is nothing so essential on the farm as brains and good judgment, and the farmer may cultivate and develop these as well as corn or wheat.

Another very important thing in farm management is to determine how much of the land to plow. There are localities where the plow is the worst enemy of the farmer. By this I mean that many farmers keep themselves and their lands poor by excessive cropping. The farmer should keep ever before him the fact that it is bushels not acres that gives the profit.

No man can by farming make anything above a mere living who grows only average crops. Ohio is a good agricultural State, one of the best in the Union, and the crop statistics for the last quarter of a century show, of the two great staples, wheat and corn, an average per acre, of about 12 bushels of the former and 33 of the latter. Remember, these are the averages, and of course there are thousands of farmers that fall below this. Is it any wonder that many farmers are poor and in debt growing such crops?

In my judgment, there is no one thing that has contributed so much to this as the keeping of too large a proportion of the land under the plow, and the lack of an intelligent rotation. The difference in the cost of a bushel of wheat grown on a field averaging ten, and one averaging thirty bushels per acre is surprising, and the same general rule holds good with other crops.

There are thousands of farmers owning farms varying in size from 100 to 150 acres who are poor and likely to remain so just because they keep two teams and plow sixty or eighty acres a year and do not grow any more grain than they could with one team and half as much land under the plow. The difference in the profits of two farmers, one of whom cultivates what one team can do, and the other on a similar farm of the same size who keeps two teams, will often be greatly in favor of the former. Let us suppose that two farmers try these respective plans for ten years. Number one, who keeps but one team saves three hundred dollars at the start in horses and harness. He would require in the ten years, extra plows, horse-shoeing and harness repairing, one hundred dollars more. I think one dollar a week as cheap as a work-horse can be kept, even on a farm, and this would make $104 per year, or $1,040 for ten years. Then there must be a hired hand eight months in the year to drive the team, and he, at $15 a month, will cost $120 per annum more, or $1,200 for the ten years. It is worth $2 per week to board a hand, or, say, $70 for the eight months, making $700 for the ten years. Bringing all these items together, we have $3,340; but supposing the old horses and harness are worth $100, we will call it $3,240 that the farmer with two teams has expended more than the other.

But, says some critic, has he not had a fair return for this expenditure?

In most cases, no.

The land left unplowed by the farmer with the one team was not unproductive, but was yielding crops of butter, meat, wool, or other animal products, and at the same time storing up fertility for future crops of grain; and when again plowed, would give a largely increased

yield per acre over the fields which had been continuously cropped. The result would be that with this management the farm with the one team would sell more in ten years than the other.

Here are two systems contrasted. All that the farmer has to show for his $3,240 and the labor and worry connected with its expenditure, is an exhausted soil. I should expect ten years of the one management to result in a discouraged farmer, whose sons would choose some other calling in life; whose farm and home would present a thriftless and cheerless appearance, and who himself would be complaining that farming don't pay, and be talking of selling and "going west."

With the other management I should look confidently for a happy and contented farmer, on a fertile and thrifty farm, with a bright and attractive home, and a family attached to the calling.

Success in farming can only be attained where there is a plan carefully chosen, well arranged and faithfully pursued.

CHAPTER IV.

FARM BUILDINGS.

Much of the comfort of the farmer and his family, and also of the stock, depends on the buildings found on the farm; and their arrangement and location is important, both as regards appearances and economy of time and labor.

Perhaps the first consideration should be, to have them adapted to the farm, its productions, and the means of the farmer. I would always advise the farmer to build a small, comfortable house or barn, which he could pay for, rather than to run in debt for large and expensive buildings.

Occasionally, a farmer with a small and unproductive farm will put up buildings out of proportion in size and cost to the farm; or a man with a large body of land will put up one immense barn instead of two or three smaller ones. This I do not think wise for several reasons: 1st. It involves much loss of time in drawing in the crops. If you are getting in a field of hay or grain with rain threatening, it makes a great difference whether you have a hundred rods or a mile to go. 2nd. It makes extra work also in drawing out manure, for this will naturally be made at the barn. 3rd. In case of fire the loss will be much greater both on building and contents. And lastly, when the farmer dies, and the property, according to our excellent American laws is to be divided among the children, it makes a fair division difficult.

The finest barn I ever saw was built by a man owning twelve hundred acres of land, and was burned without insurance since I visited it in 1876. Although I admired this barn exceedingly, these objections occurred to me. While I would recommend the best material, and that buildings should be constructed with reference to durability, I have seen so much of the evil of debt in cramping the farmer and causing self denial to himself and family that I would recommend temporary buildings for his stock and crops rather than to see him burdened with debt for expensive ones.

THE BARN.

A very cheap barn, and one that will last for many years, can be made by setting locust posts in the ground for the outer walls and spiking or bolting the nail ties to them. The inside rows of posts can stand on stones and there need not be a mortise or tennon about the building. A barn thirty feet wide and of any desired length may be put up in this way, and as every board and nail tie in it is a brace, it will be firm and substantial. In building in this manner I would always use hard wood for the frame. I would not recommend a board roof under any circumstances, as I have never seen one that gave satisfaction.*

The farmer who has the means should put up no cheap temporary buildings, but the fact that there are many who dread a burden of debt and badly need barn room leads me to speak of this method.

In building a barn one should take plenty of time to study his plan, and should make every possible arrange-

*In some of our timber regions, boards are so much cheaper than shingles, that many will continue to use them. My western experience has convinced me that a board roof made of good boards, well sapped, seasoned, and properly put on, will last many years and give excellent satisfaction. R. S. T.

ment for saving steps and labor. During a large part of the year the farmer attends to his stock when wearied by field work, and every step saved is important. I believe it is easy to so arrange a barn that fifteen minutes' time can be saved each day, and in addition the labor lightened; and this will pay for quite an amount of planning.

Where a barn is built for cattle feeding, the most convenient arrangement I have ever seen is to have your stables enough lower than the barn floor so that the cattle can eat their hay and fodder directly from the floor. This saves the expense of mangers, and also saves room, for the stables can be made narrower by the space the manger would occupy. It makes the lofts easier of access also as the upper floors can be dropped to correspond with the stable floors; that is, if your cattle stand three feet below the level of the barn floor, the loft floors need be but four feet above instead of seven as would be necessary if the cattle stood on a level with the floor. The stables can be arranged on three sides of the floor, and if the barn is thirty feet wide and the floor twenty, there will be ample room for nineteen head of cattle: seven on each side and five at the end, and it will be the work of a moment to give hay or fodder to all of them.

Another thing which I have found very convenient is to so arrange the wagon-shed if connected with the barn that as you drive through it the barn floor will be just on a level with the bottom of the bed. This makes it very convenient in loading or unloading barrels, or sacks of grain, and where corn which has been cut up is hauled in to be husked in the barn, it will save one hand in unloading, as no one will be needed on the wagon to hand it down.

The bins for meal and bran, and the cribs for corn should be arranged with reference to saving steps, and every detail should be made a matter of study.

There is a point in which many farmers could make an improvement on the approaches to the barn, and that is by so arranging their fences that they need not pass through the barn-yard to enter the barn. Where this must be done it is almost impossible to do the work without getting the boots smeared with manure, to the great injury of the boots and to the great detriment of the good wife's carpet and floors, and the farmer is likely to advertise his business by an unsavory odor. It is so easy to arrange the barn-yard so that the barn can be entered without passing through it that I wonder every farmer does not do so. Even the barn-yard into which the cows are turned may be made a few feet from the stable door so as to leave a passage which can easily be kept clean, for if the cows can get to the stable door they are sure to stand there and drop their manure and in a wet time tramp it into mud. Instead of having the barn form the fence for one side of the barn-yard, set your fence ten feet from it, have this passage way raised above the level of the barn-yard and well graveled, and you will have no difficulty in keeping it clean and the stock can easily be turned across it into the barn-yard.

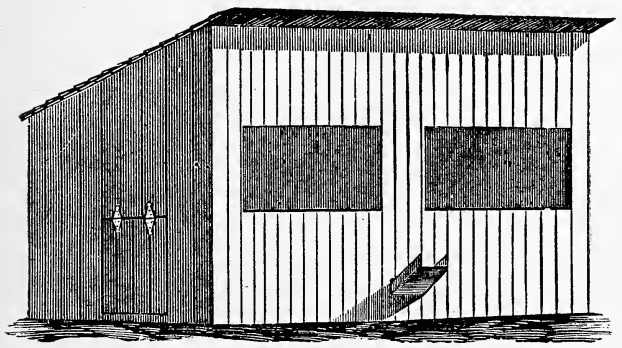
The location of the barn is a matter of considerable importance. It should not be so near the house as to be offensive, nor so far as to make it laborious to travel back and forth. It is a moderate estimate that a farmer and his help will make an average of ten trips a day from house to barn, and if the latter is fifty yards farther away than necessary it involves something more than one hundred miles unnecessary travel each year. A barn can be located within fifty yards of a house and so

managed as to offend neither eye or nose. Another important thing is that a well drained spot if possible be chosen for the barn. I do not mean that it should be built, as I have often seen, on a steep hillside sloping to a brook, so that every rain carries the soluble part of the manure away; but on the other hand, it should not be on low ground into which water from adjoining fields can flow, and the barn-yard especially should be so arranged that the water could neither flow into nor out of it.

HOG HOUSES.

One or more pig pens or hog houses are indispensable on farms where swine are kept; they are needed to confine breeding animals, and to shut up young pigs at weaning time. I have made quite a study of hog-houses, having built six in the last twenty years, and I have never seen a plan which, for convenience and economy, was better than mine. I build eight feet wide, and twelve, fourteen or sixteen long—one of the latter size being large enough to fatten ten hogs weighing three hundred pounds each, and the smaller one makes comfortable quarters for two sows with litters. For a foundation, locust posts or large boulders may be used, or pillars of stone, or brick masonry. Two sills, eight feet long and six by eight inches square, are placed on the foundation at the ends, and from one of these to the other place joists two by ten inches, and the length your house is to be. Bridge your joists so that the weight will come on all alike, and then lay the floor of inch lumber, double, so as to have no cracks go through. I have tried two-inch stuff for this, and find that it does not last any better, and costs more, as the lining of the floor may be of cheap lumber, and even if strips four inches wide are used at the cracks, it will answer. After the

floor is laid, cut your corner-posts of four by four studding—hard wood is best—and place them at the corners. As the roof is only to slope one way, the rear posts need only be four feet high, and the front ones seven, unlesss you want a loft over head, in which case the rear posts should be eight feet high, and the front ones eleven. Spike a two by two inch studding on the top of your posts at front and rear, for a plate; fit in another for a nail-tie in the front, or two in front and one at the rear, if you want a loft, and let the rear tie and the upper front one be the right hight for the upper



HOG-HOUSE.

floor. You will need one or two nail-ties at each end, according to the hight, and your first pair of rafters must stand flush with the sills and nail-ties. Board it up and down, and as the front and rear boards will be nailed at the bottom to a joist, and the end boards to the sills at the bottom and the rafters at the top, you will find your building firm and substantial when finished, although there is not a mortise or a tenon about it. Two hands can complete such a building in less than two days' work, and one thousand feet of lumber and a

thousand shingles will be about a fair estimate for a building of this size. It will require a little more lumber if it is made high enough for a loft, but this will give storage for a hundred bushels of corn.

No hog-house is complete without a floored yard of equal size attached to it. The floor of the yard should be a foot or more lower than that of the pen, and may be of cheap lumber, or stone. It is impossible to keep hogs confined on an earth floor without having a porridge hole, breeding foul odors; but with a floor, and a supply of any good absorbent, such as chaff, cornstalks, straw, or sawdust, the pen can be kept comparatively sweet, and a large amount of valuable manure saved.

It is well to have a movable partition to put in the pens when they are used for brood sows. The boards should be made to slip between pieces nailed up and down just far enough apart to receive them, and then fastened down with a pin or key. Where sows are to be kept at farrowing time, there should be no cracks in the partitions. A rack should be made up next to the rafters to receive these partition boards when not in use. In pens used for breeding sows, it is a good plan to nail a two by four studding six inches above the floor, to prevent the mother from overlaying her pigs. This should be nailed so that the four inches would project into the pen.

OTHER OUTBUILDINGS.

I have but two suggestions about the privy, one of which is, that it should be protected from observation by vines or trees; and the other, that it should never have a vault under it. A shallow box, raised high enough so that it can never be flooded by surface water, and into which dry earth is thrown often enough to disinfect it, will not only prevent danger of contaminating the well,

but abate a nuisance, and furnish several dollars' worth of excellent fertilizer each year. No better disinfectant was ever found than dry earth; and a privy, by its use, may be kept perfectly free from odor.

Every farm should have a poultry-house, and the manure from two dozen fowls will pay for it in a few years, if it is built economically. It makes little difference in what shape it is built; but there should be a tight floor under the roosts, and it will be a saving of space if this floor slopes so that the manure will roll down on to a narrow floor, or into a box, where it can be easily taken up. The space under this floor can be used for nest boxes. The poultry-house should face the south, and on this side have a large window; but the glass must be protected with a wire screen, or strips of lath, as the hens will break them. Where large, heavy fowls are kept, the roosts should be low, and in no case should the roosts be made one above another, as the fowls will always strive for the highest roosts.

There should be a wood-shed on every farm, and this should be near the house. It may be large or small, but should hold at least a month's stock of wood; and there should be a bin for kindlings; but it is better that it should be large enough to hold a stock for a year. Buildings that must be prominent, should be finished with some regard to appearance, and a little money will be well spent in making the wood-shed neat and tasty.

Although not strictly to be classed as a farm building, the ice-house should be found on many farms. Where there is an unfailing supply of very cold water, it can be dispensed with; but where this is wanting, there are months in which first-class butter cannot be made, and milk, fresh meat, and many articles of food, cannot be kept twenty-four hours without the aid of ice.

A good supply of ice will enable the farmer's wife to make good butter in dog-days, and to save much that would otherwise be lost; besides, ice is indispensable in many forms of sickness.

There is an idea among most farmers that an ice-house must be an expensive building, with double walls, or sunk in the ground. There is no purpose for which a building is needed, where so plain and cheap a structure will answer, as for an ice-house. All that is necessary is, to have a roof, and walls that will keep the sawdust in its place. I have seen at one of the cheese factories on the Western Reserve in Ohio, an ice-house that would hold one hundred tons, made, roof and all, of cheap, refuse lumber, and that probably did not cost over thirty dollars. All that is necessary for ice to keep is, that there should be good drainage, to insure which throw in a foot of broken stone, or, if more convenient, wood or old rails will answer, and cover with six inches of sawdust; that there should be sufficient bulk; that it should be well packed; that there should be at least twelve inches of sawdust at the sides, tightly packed in, and eighteen inches above it, and a roof above, to keep the rain off. The gables need not be boarded up, or, if they are, it is best to have windows open for ventilation. The farmer who can make a pond on his farm, from which to cut ice, or, who is convenient to some good source of supply, can, in addition to furnishing his own family, often make a handsome profit from the sale of ice. In estimating how large to build, you will allow forty cubic feet for a ton. I do not think less than 25 tons of ice will keep through the summer, and the proportionate waste will be much less with a larger bulk. The ice-house should be visited every day, as soon as spring opens; for even before the weather is very warm, during

the winds of March, the ice will shrink and waste to some extent, and if an air-hole is formed, it will waste rapidly. Tramp over the top at every visit, and level the sawdust so as to fill up any holes which are beginning to form.

TOOL-HOUSE.

A tool-house, which may be a separate building, or a shed attached to the barn or one of the other buildings, is one of the most important out-buildings of the farm. Without it, the plows, harrows, rakes, reapers, etc., etc., will often be left exposed to the weather, and doubtless the loss in a few years to these implements is, on many farms, enough to build a shelter for them.

INSURANCE,

When the farmer has provided the necessary buildings, there is one point more to be attended to, and that is, to keep them insured. The rates for isolated farm buildings are always low, and no farmer should take the risk of fire, when it can be so cheaply guarded against.

CHAPTER V.

FENCING.

A heavy item of expense on the farm is, building and keeping in repair the fences. In most timbered countries, a few years ago, the fences were nearly all made of rails. On a large majority of farms there is no rail timber left, and something else must take the place of the old Virginia fences as they disappear.

Hedges have been extensively planted, but there are serious objections to them, and those who have had the most experience with them are the least satisfied. There is but one plant used for this purpose to any great extent, and that is the Osage Orange; and while a good fence *can* be made of it, it is very seldom that we find one. The plant makes such a vigorous growth, that nothing less than three trimmings a season will keep it in shape, and this work must be done at the busy season of the year, when everything else is pushing.

If, as some do, we adopt the plan of trimming once a year, in winter, the hedge grows out of shape early in the summer, and soon becomes so tall as to hide the fields from view, and injure the crops, both by its shade and by drawing moisture and nourishment from the adjoining soil. The division fences of a farm should be moved occasionally, and this is an objection to using hedge for anything but line fences. The fact that not one line of hedge out of a hundred is so cared for as to give satisfaction, and that two or three weeks neglect at the growing season, will make it a difficult

and laborious job to get it into good shape, leads me, after an experience in the care of hedges of thirty years, to advise farmers to plant but little of it. The only circumstances under which I would plant hedge, would be to border some permanent pasture away from the road, where I could allow it to grow without trimming, after it was thick enough at the bottom to turn stock. On many farms there could be a line of hedge managed in this way, so that it would not disfigure the farm, and would afford a good wind-break, and make a cheap and satisfactory fence.

For general fencing, it seems pretty well settled now, post and board, or post and barbed wire, will be the main dependence. In many sections, a good stock law, well enforced, is being made a substitute for outside fences, and doubtless will become more general as the country becomes more thickly settled. It certainly is greatly cheaper to fence cattle in than to fence them out.

POST-AND-BOARD FENCES.

In putting up a fence of this character, it does not pay to do a poor job of work. The posts should be of locust, cedar, or some other durable wood, well set in the ground.

To prevent heaving by the frost, a deep notch may be cut into each side of the post near the bottom, and a flat stone crowded into it, so that the post cannot be lifted without raising the stones.

Various plans have been tried for the preservation of posts. I have found that the selection of good posts, of durable timber, is one of the most effectual, and, in the long run, the cheapest. Painting the part of the post that goes into the ground, or for that matter, the whole post, with coal tar, is inexpensive and quite effectual.

I have tried on Eastview farm the plan of growing the posts where they stand; that is, I have planted a row of

trees where I intend the fence to be, set the right distance apart for fence posts. As soon as large enough, I shall stand against them panels of board fence, securing them at the top with tarred twine, or wire, tied loosely, so as not to injure the trees, and fastened at the bottom with a stake. The trees can thus do duty while growing into valuable timber.

A fence along the highway, in front of the farm, should be neat and attractive, and some expense should be allowed merely for looks. But for other fences, something in looks might be sacrificed to economy and service. In such cases, I would recommend nailing the boards to both sides of the post; that is, nail the boards at one end of the panel to one side of the post, and the boards for the next panel to the other side of the same post. Thus, in a fence running east and west, I would nail the boards of the first panel to the north side of the first post and south side of the second post; the next panel to the north side of the second post and south side of the the third post, and so on. The advantages of this plan are that you save all sawing and fitting of boards—if a board is a little long, it projects that much. The fence is much stronger, as you do not have to nail so close to the ends of the boards, and the nails will therefore hold better. You can also use all your inferior posts for the centers of the panels, as you will nail only to one side of that post, and the ends of the boards will not come against it at all.

In setting the posts for such a fence as this, set first the posts for the ends of the panels in an exact line, then lay a board across from post to post angling, the way it will be when nailed on, and set your mid-panel post by that, as it will not be exactly in a line with the others. For a very cheap fence the mid-panel posts

might be quite small ones sharpened and driven in with a maul or sledge.

On level ground a three-board fence may be so made as to turn any stock.

Leave a space of one foot beneath the first board, five inches between that and the second, and ten between the second and third. This will make the fence three feet nine inches high. Next plow a couple of furrows on each side throwing the earth towards the fence, and with the shovel shape it up into a round ridge with the center immediately under the fence. This ridge should, of course, be immediately seeded down in grass.

If you plow nine inches deep, the top of the fence will be four feet six inches above the bottom of the ditch, and cattle with their fore feet in the ditch, and hind feet on the level, could not possibly jump it; while if they came up so as to get their hind feet in the ditch, they would be too close to jump.

I think it a good plan to have fencing sawed eleven feet long—as then three panels would make exactly two rods, and furnish a convenient land measure—and a sharpened stake is then sufficient for the center of the panel.

In every line of board fence, even when it divides two farms, a movable panel is a convenient thing. To make this, select light, strong boards, and nail them to light uprights, and stay the panel with a brace or two of one by three inch material. Let the top board of the panel be six inches longer than the others, so as to project three inches at each end. Saw down six inches into the top of your posts two cuts an inch and a quarter apart, and with an augur bore this piece off at the bottom; this makes a slot to receive the projecting end of your top board; a pair of small stakes can be driven close

to the posts at each end, to prevent the bottom of the panel from being blown or crowded out. When you wish to pass through, this can easily be lifted out and put back, and yet there is no danger of its being blown down or opened by stock.

BARBED WIRE.

This is very rapidly coming into use, and in the prairie sections of the West is taking precedence of all other fencing material. It is certainly cheaper than board, as the wire will practically last forever, and it requires fewer posts. I have seen large herds of cattle grazing alongside of a corn field, from which they were separated only by a barbed wire fence, with the posts fifty feet apart. This is wider than I would recommend; but a good post every thirty feet, with a stake driven midway to stay the wire, will make a good fence; and this constitutes a lawful fence in several of the Western States. I think a good cattle fence can be made for less than fifty cents a rod, using three wires.

One great advantage of barbed wire is, that in level countries it does not occasion snow-drifts, and is not as liable to be blown down as either rails or post and boards. The only disadvantage connected with this fence is, that cattle and horses will sometimes run against the wires, receiving dangerous, or even fatal wounds. I have seen a combined board and wire fence, that seemed less liable to this objection. Two boards are placed at the bottom, and two barbed wires stretched above these. Every fourth post is the full hight, the remaining three being only eighteen inches above the the ground.

In building a wire fence, the end and corner posts must be well braced by a heavy piece of timber from the top of the end post to the foot of the next one, and the wires must be tightly strained. I do not give fur-

ther particulars here, as the manufacturers of barbed wire usually furnish full instructions to those who purchase the wire.

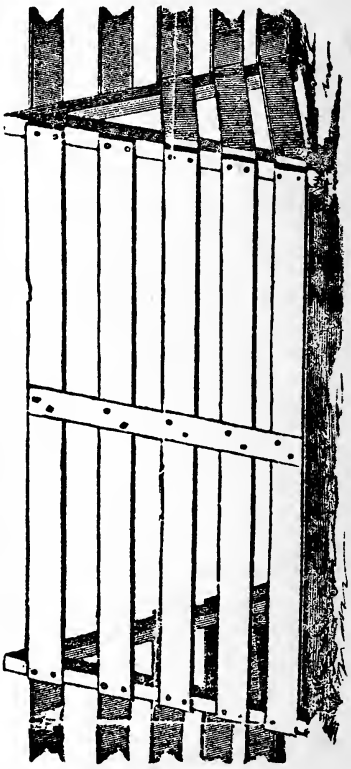
AN IMPROVED POST-AND-RAIL FENCE.

Where there is still some good rail timber left, an excellent and durable fence may be make by setting posts ten feet apart, splitting the rails quite thin and flat, and nailing them on to the posts with good, heavy nails. This fence requires fewer posts than a board fence, uses about one-third as many rails as a worm fence, and as the rails are lighter, saves fully three-fourths of the timber, and the rails will last longer than boards.

PORTABLE FENCE.

A fence easily set up and taken down is greatly to be desired, and I have given the matter much thought. Four years ago I invented a fence, which I called a Self-supporting Truss Fence. The principle of this fence is, to make one panel support another, by leaning them against each other. The uprights, which take the place of posts, should be of hard wood, two inches square. These uprights are beveled at the top, so as to exactly fit when the bottoms of the panels are three feet apart. The three short boards, which you can see at the right of the cut, are nailed to the uprights as the panels are set up, and close the space and support the fence. There is no need of nailing the tops of the uprights together, as these boards hold them to their place perfectly. I wish I could truthfully say that this fence would never blow down. I had it in use three years before a panel of it did; but a gale finally tipped over some twenty rods of it. An expense of one dollar will, however, fix forty rods of it so that nothing short of a hurricane will blow it down. There are two ways of doing this: One is to drive a short stake in the ground,

flat against the brace boards at the end of the panel, and drive a single nail through it into the upright. These stakes should be high enough to reach to the second board, and the nails should be long enough to go through both stake and board, and hold in the oak upright. These short stakes should be driven on opposite sides, alternately. The other way to make it secure would be to drive a stake in the ground at every third or fourth panel, in the notch formed at the ends of the panels, and let the stake come up as high as the top of the fence. The fence might stand for years without this precaution, but it will cost so little to attend to it, that I would advise that it be done. When the tall stakes are used, it would not be necessary to nail the fence to them.



BROWN'S SELF-SUPPORTING TRUSS FENCE.

While this fence cannot strictly be called a portable one, it can be moved by simply loosening the three short brace-boards, and a given amount of it can be taken down and put up in less than half the time required to

move a rail fence of the same length. One great advantage of this fence is, that it can be made under cover, in wet weather, and during the winter, while ordinary board fence can only be made when the weather is good and the land dry. In making this fence, you need three strong trestles, made of timber heavy enough so that you can nail on them. After you get one panel made just right, with the boards spaced to suit and the ends square, you will always keep it on the trestle for a pattern, and by-laying the uprights and boards directly over those on this panel, you will get your panels right. I do not find five boards necessary, although there are five in the cut; for the fact of the panels leaning makes the base broader, and stock are less likely to jump it than if it stood perpendicularly. A sixteen-foot panel is too long, as it will sag a little in the middle, and I prefer to make them eleven or twelve feet long. If you wish to make it eleven feet, buy part of your fencing twelve feet, and part fourteen feet long, and then you can cut the top brace-board from the twelve-foot lumber, and the other two from the fourteen.

That this is a cheap fence is easily seen. If the uprights are made of two by two inch stuff, it takes but three feet of lumber for them. It will not cost for the labor, more than five cents a panel to make it, and two cents to set it up; while to make a post-and-board fence costs twenty-five cents a panel for labor, and two posts, which, if good locust is used, will cost twenty-five cents each.

A three-board fence of this kind will turn cattle. A flat stone, or piece of board, can be placed under each of the uprights of this fence, so as to prevent all contact with the earth, and keep them from rotting. I would not do this until the fence was built, as it will be easier

to put them under then than when setting up the panels. I feel confident that if this fence is given a fair trial, it will come largely into use for the division fences of the farm. All the fence except the uprights should be of pine, or light lumber. When made of heavy lumber, it is more liable to sag.

LESS FENCING.

There is one important point in connection with the fence question, to which I wish to call especial attention, and that is, that farmers build too much fence. I see no reason why forty, sixty, or eighty acres of the best plow land on the farm should not be thrown into one field, and so managed as to turn no stock on it. I have practiced this for fifteen years on my own farm, and am much pleased with it. I find that a crop of clover allowed to grow and develop fully, so as to be cut for hay and seed, or the second growth turned under, helps the land more than when pastured off, and I believe that clay lands are often as much damaged by the tramping of the stock as they are benefitted by the clover. With our modern implements for saving the crops, we need not leave grain on the fields for the stock to glean, and we can make as great a profit, and keep the land up better, by farming our best land without fences. If there is land not well suited for tillage, it can be kept in permanent pasture. If all the farm can be cultivated, it might have one permanent fence dividing it through the middle; and the self-supporting fence described can be moved to fence off any particular part you wish to pasture. The exercise of thought and judgment in the matter of fencing the farm, using the best material where a permanent fence is needed, and dispensing with all unnecessary fences, by increasing the size of fields, and using the portable fence where it can

be used to advantage, will enable many farmers to reduce the expense of fencing their farms at least one-half.

GATES.

If I wish to get a pretty close estimate of the character of a man, I go and look at his gates. If I find them secure, well hung, well fastened and easy to open and easy to shut, moving almost with a touch of the finger, I conclude he is a thrifty, careful man, and is having success in farming. If, on the other hand, I find them hung by one broken hinge, or on a sagging post, so that they have to be dragged around through the mud, and become nearly blockaded with every snow, with latches or hooks out of order—or altogether wanting—and the gate propped up with a pole or rail, I judge that in all his work and all his business, he is as shiftless and careless as he is with his gates, and that his success in farming will be so small that the less business dealings I have with him the more profitable it will be for me.

From the number of dragging gates one sees in the country, it might be imagined that the hanging of a gate so it will not sag or drag, is one of the unsolved problems of the day; but, in point of fact, only three things are needed:

First. Common sense.

Second. A well built gate.

Third. A well set post.

The lack of the first, displayed in many gates and gate-posts, is really astonishing.

The lack of the second is found in gates made out of soft lumber, badly braced, and often twice as heavy as need be.

The lack of the third is seen in poor, spindling gate-posts, which look as if they had grown in a dry summer, set in the ground so short a distance that every frost

throws them out of position, and which, as soon as the ground becomes thoroughly softened with rain, yield to the side draft of the gate.

Now that bolts are so cheap, a good gate may be made without a mortise. It should be made of hard, lasting wood, except the slats, which should be no larger than necessary, as lightness is very desirable. At the hinge end, a strip, one by four inches, is put up on each side of the slats, and securely bolted through. The same is done at the latch end, but the uprights may be lighter. Two three inch slats—which need not be more than three-fourths of an inch thick—extend from the bottom of the gate at the hinge end to the top at the latch end, and a bolt put through at each slat, passing through both braces and slat. An extra strip may be put on to each side of the top slat at the hinge end, and the hinge, which should be a long strap one, securely bolted through. A gate thus built may rot down, but will never sag. When finished it should have two good coats of paint, and the lumber of which it is made should be thoroughly primed before the gate is put together. Every gate on the farm should be long enough to allow the reaper to pass through.

The post on which the gate hangs, should be *at least* eight inches square. The portion set in the ground may well be left unsquared. Bear in mind that the larger the piece of timber set in the ground, the greater the force required to drag it over, as it exposes a greater surface to the earth.

Forty inches is the least depth a post, intended to support a heavy gate, should be set in the earth, and four feet is better. A heavy sill, laid at the level of the ground, and exactly fitting between the two gate-posts, will not only make it impossible for pigs to root under

the gate, but will make it almost impossible for the post to get out of perpendicular in that direction — and if set as above directed, it is not liable to lean in any other direction, unless the gate is left open a great deal.

The fastening of a gate may be either a latch, a hook, or a peg. If the latter, the peg should be fastened to the post by a strap, to prevent it from being lost or carried away. When a gate is well built, as above described, so as never to sag, there is no reason why it should not be fastened with a latch, that will need only that the gate be pushed to.

The approaches to the gate on both sides should be thoroughly graveled, so as to make a muddy gateway—one of the greatest abominations on the farm—an impossibility. The young man who has, every time he comes to a gate in wet weather, to get out of the wagon, wade through deep mud, carry round one end of a heavy, dragging gate, drive the team through, go back, drag the gate to, prop it with a rail, and get back into the wagon with wet feet, boots muddied to the top, and a temper sadly ruffled, must either be deeply attached to the occupation of agriculture, or else sadly lacking in appreciation of comfort in life, if he do not begin to look for some occupation attended with less hard and disagreeable incidents of work.

But some one objects that it will be an expensive job to set a gate in this manner. Yes, it will cost something; but the time wasted in using such gates as we often see, will amount to much more in a single year than the entire cost of gate, post, labor and graveling. Of course it would be folly to go to this expense for gates in places where they will be used but seldom. In such places a light lift-gate costs but little, and is preferable to a poorly hung hinge-gate.

It should be made like the movable panel, before described, except that the top board need not project, and it should be made of good light lumber, well put together. What would be the hinge-end stands between two stakes, fastened together at the top, the one on the side towards which the gate opens being a little more than its width back of the other, so that the gate will not bind on them when opened. One of the boards of the gate rests on a piece of hard board with a rounded edge, nailed across from one stake to the other. Of course, the bottom board should clear the ground by two or three inches. The latch-end goes in between two stakes. To open this gate, you will slide it back enough to clear the stakes at the latch-end, and then carry that end around.

One concluding point: In gates, as in fences, have as few as possible; for every gate is an extra expense, and even the best occasion, in the course of a year, a great amount of lost time. The intelligent farmer can think over this point and draw his own conclusions.

CHAPTER VI.

DRAINAGE.

It is no part of the plan of the present work to furnish an exhaustive treatise on drainage. Volumes have been written on the subject, and doubtless more will be. The man who has a large farm requiring extensive and systematic drainage—in which he expects to spend hundreds or thousands of dollars, will do well to invest a few dollars in some of the complete and excellent works on the subject that are now in existence, and secure the assistance of a civil engineer.

The object of this book is to be an aid to the practical farmer in the ordinary work of the farm, and the drainage of a field, or portion of a field, often becomes an important part of this ordinary work.

I would wish to relieve the average farmer of the idea which is sometimes entertained, that it is hopeless to attempt anything in the way of drainage unless he can employ a civil engineer and have it done scientifically. In the great majority of our western farms, the average farmer, with the exercise of an average amount of common sense, can manage the entire matter.

I shall not in this article say aught concerning stone, or board, or straw, or brush, or any of the other materials that have sometimes been used for drains, for practical experience has narrowed the matter to the use of common round tiles, and we have no space to waste in explaining methods that ought never to be used.

WHAT ADVANTAGE IS THERE IN UNDERDRAINING?

It prevents the drowning out of crops in wet seasons.

It enables the farmer to work the soil earlier in the spring and sooner after rains.

It prevents the *souring* of the soil caused by excessive moisture.

It lessens the risk of freezing out in winter grain.

It lessens the risk of surface washing.

It keeps the ground moist and the crops growing in a dry season.

It makes the ground warmer.

It permits a more thorough pulverization of the soil.

It increases the fertility of the soil.

To read this list of advantages may at first make one think of the advertisements of some patent medicines which are warranted to cure all and the most dissimilar complaints, but there is not one of the above points but what has been demonstrated practically, and can be explained scientifically.

HOW DRAINAGE IS BENEFICIAL.

To comprehend this we must consider as briefly as possible some of the characteristics of the soil, and the requirements of successful plant growth.

No soil can produce useful crops when it is permanently saturated with water.—Such a soil may grow reeds and rushes, but not crops of wheat or corn.

The best condition of soil for successful plant growth is found when the particles of the soil are moist, but when there is no standing water between these particles.

Whatever means will bring about this condition, will accomplish all the results just stated as being accomplished by underdrainage.

In wet seasons, if no adequate means are provided for removing the excess of moisture that falls upon the soil,

it will be continually saturated and the crops will be drowned out. Underdrainage, by furnishing means for the escape of the surplus water prevents this.

It needs no argument to prove that underdraining enables the ground to be worked earlier in the spring and sooner after rains, but farmers should consider the advantage connected with this. The success or failure of a crop may often be determined by the time when the ground for them can be prepared.

Water standing in the soil causes the vegetable matter to undergo what chemistry calls the acetic fermentation, thus rendering the soil sour and unfit for cultivation; of course underdrainage removes this evil by removing the cause.

The "freezing out" of winter grain is not occasioned by the excessive cold, but by the formation of ice in the upper part of the soil, which throws out the plant and leaves it to perish. If the soil is underdrained the water passes off through the drains instead of remaining in the surface soil and this injury is avoided.

If the soil is full of water, that which falls upon it in a rain must flow off over the surface, carrying with it much of the best and finest of the soil, and often doing much damage.—Underdraining leaves the pores of the soil empty, so that the water falling upon it sinks directly in, to be ultimately carried off by the drains. As an illustration of this may be noted that even steep hill sides in some of the north-eastern counties of Ohio, where the subsoil is gravel, which forms a natural underdrainage, do not wash at all, while comparatively level fields in sections resting on tough clay or hard pan, are continually being gullied out by the surface water.

All these points are reasonably clear, but we now come to a claim that at first seems paradoxical:—How can

draining land keep it moist and the crops growing in a dry season?

First. By enabling the farmer to thoroughly pulverize the soil, and I shall show in discussing pulverization how that fits the soil for drawing up moisture from below.

Second. By preventing the soil from becoming baked and cloddy. When a soil is saturated with water, and becomes dry simply by evaporation, it hardens and bakes so that it is incapable of receiving moisture either from the air above or the earth below.

Third. By causing the plants to send their roots deeper into the soil. When a plant begins to grow in the spring in an undrained soil, the roots will not penetrate into the cold lower soil filled with stagnant water, but run along through the few inches of drier surface. When the dry weather comes the sun completely dries this out, and the plant having no other source of supply, perishes. On land that has been underdrained, the soil is left in the condition described as most favorable for plant growth: moist, but with no standing water between the particles, and the plant sends its roots far and deep. When the sun of summer dries the surface of the ground, the plant has communication with the cool moist soil far below.

The past season, 1881, has demonstrated the truth of this claim beyond a question. The best crops were grown on the well drained fields.

Underdrainage makes the ground warmer:

First. By admitting the warm air into the soil. As fast as the water is drawn off from below, the warm air follows, penetrating and warming the soil.

Second. Because a dry soil can be warmed more readily than a wet one.

Third. Because evaporation is avoided. Every one who has ever been caught in a shower of rain, and stood with his wet clothes on, knows how the evaporation of the water chills him. Science teaches us that the evaporation of one pound of water requires four times as much heat as would be required to raise the same amount from the freezing to the boiling point. We see therefore that if the water that falls upon the soil remains until removed by evaporation, all the heat which should be making the soil warm is being wasted in evaporating the water.

Everybody knows that if a jug of water is wrapped up in a wet flannel, the water in the jug will not get warm as long as the flannel is kept soaked with water. Just so with the soil. It will not get warm as long as the surface is full of water.

Experiment has demonstrated the truth of theory in this matter. One experimenter made a number of tests in two adjoining fields, one drained, the other undrained. The average temperature of the soil in the field that had been drained was $6\frac{1}{2}$ degrees higher than in the other. Further experiments have fully confirmed these.

And this adds another to the reasons why drainage enables the earlier cultivation of a field and lengthens the season: the ground becomes warmer so much earlier in the spring and remains warm later in the fall.

Drainage increases the fertility of the soil in exactly the same way as pulverizing does—by enabling the soil to absorb fertility from the atmosphere. I describe in the article on pulverization the absorptive power of dry earth; but soil saturated with water not only cannot be penetrated by the air, but also is incapable of absorbing any fertility from it. Therefore, thorough drainage adds greatly to the fertility of the soil.

WILL IT PAY TO DRAIN.

This is certainly one of the most important questions connected with the whole subject. No matter how scientific the theory or desirable the results—if the cost is greater than the accruing profits, the man who would have success in farming will wisely leave drainage for the amateur who farms for love and not for profit.

Sometimes, in our western states, land may be found that is utterly worthless, but which would yield unfailing crops if thoroughly and systematically drained. Here the reader will say, is certainly a place where drainage will pay.—But wait, perhaps it will cost $50 per acre to reclaim this land, while equally good land can be bought for $15 or $20 per acre, that needs no drainage. In this, as in everything else on the farm, common sense is the necessary guide.

In many sections an expenditure of from $10 to $20 per acre will accomplish the desired result, and where corn brings 40 cents, and wheat $1 per bushel, the increased yield, even in the favorable years, will far more than pay the interest on the investment, and in exceptionally wet or dry seasons, the drained land will often produce a good crop, while the undrained will produce none—and this single crop more than pay the whole original cost. An excellent illustration of this will be found in the chapter on wheat.

HOW DOES THE WATER ENTER THE TILE?

This question is often asked, and is of some importance, as some persons get the idea that it is necessary to leave spaces between the tiles to admit the water—which spaces admit stones and dirt, and sometimes occasion the stoppage of the drain.

The water enters partly through the spaces between the tiles, which, even when they are laid as closely as

possible, are far more than sufficient for this purpose. The true plan in laying tile is to make the joints fit as closely as possible, and no uneasiness need be experienced lest the water will not find its way in.

HOW TO DRAIN.

Before beginning the work of draining, the farmer should decide what he intends to do. There are many farms where nothing more is needed than to put in here and there a short line of tile to bring some low or springy spot into cultivation and the fields into good shape, and here the matter of draining is quite easy. Even on farms where a larger amount of draining is needed, the slope of the land may be such as to give a uniform fall, and to indicate plainly how the drains should be laid out. What I would caution the farmer against who lacks experience in this matter, is making a wrong start where the fall is but slight, and a general system of drains is required. On such a farm it may be necessary to expend a much larger sum than the farmer feels that he can spare at once, and if he begins with one or two hundred dollars a work that will require a thousand to complete, it is important that the money be spent in putting in main drains, with tile of sufficient size, so that at some future time laterals can be cut and arranged to discharge into the mains. It is a good plan always to so lay out the drains that there will be no difficulty in knowing exactly where to dig to tap them; and this is especially important in such cases as the above. Lay out the drains by line if possible, and make a plot of them in your account book, giving land-marks and measurements.

The most important part of your drain is the outlet. Make sure of a good fall, so that the water will flow readily from it, and see that it is protected from stock.

If the shape of the land is such that a strong stream of water is likely to run over the surface in a heavy rain, divide it if possible a few rods above the mouth of the drain, and cause part to flow on each side at a little distance from the drain. Always begin digging a ditch at the lowest point, and see that it is graded properly before beginning to lay the tile, and then begin laying the tile at the upper end, and fill as you go. The grade should be uniform, and the best way to level the bottom of a ditch, particularly if one is inexperienced, is to have the water flowing through it, as this will enable you to detect at once any inequality. There must be no low places in the bottom of the ditch, for if there are, the drain will inevitably fill up. As to depth and distance apart to lay tile, there can no general rule be given, as to answer this question one must understand the soil and circumstances. Many writers recommend a uniform depth of four feet; but, although drains act in proportion to their depth, there are soils in which it would be cheaper to lay two drains two feet deep and as many rods apart, than half the number four feet deep and four rods apart. The drains on my farm are none of them over two feet deep, and in some places we struck the limestone at twenty inches, and yet they do good service and drain to a greater distance than we are usually led to believe drains will act. As a proof how far a drain two feet deep will act, I will give a fact in my own experience. There is a neighbor whose farm joins mine, and I own the land both south and west of him. About an acre of his land in this corner was so wet that for many years no crops could be grown on it, and often in the spring there would be water standing on it, when twenty rods away the land was in good condition to plow. On the south of this, at a distance of forty feet from the line, I put down a lat-

eral drain, and two others at the distance of forty and eighty feet from the first, running them parallel with the line till they entered my main drain, the water in which flows to the south-east. At a distance of about sixteen rods from my neighbor's west line is the head of a drain which runs north-west on my north farm. These drains of mine have so thoroughly drained this land of my neighbor's that he now grows good crops on it; and although this is a heavy clay soil, these drains show their effect for at least twenty rods.

SIZE OF TILE

Is another question which requires the exercise of judgment. Where the fall is such as to give a strong current, a tile of given size will carry much more water than where there is little fall and a sluggish current. The length of the drain must also be taken into account, and if long, it will often be necessary to use a larger tile towards the mouth than at the head, to carry the accumulation of water. I have found a three-inch tile large enough for all single lines where the distance was not great, and use larger for main lines into which to run laterals. I would not advise the use of tile less than two inches in the clear under any circumstances.

There is often much unnecessary labor in digging a ditch, in digging too wide and thus removing unnecessary earth. Buy suitable tools, and be careful to lay out the ditch straight and as narrow as you can work in, and this will be avoided. Do not put in defective tiles. See that each will ring, and reject all that fail to do so.

CHAPTER VII.

FERTILIZATION.

A vital question to the modern farmer is how to maintain the fertility of the soil, or, what is still more difficult, restore fertility to soils that have been impoverished.

The American farmer, from the fact that land has been cheap and abundant, has been exceedingly prodigal of its fertility. Until quite a recent period, there was so much virgin soil to be cleared, that the farmer, as he found his fields declining in productiveness, had only with ax and torch to conquer from the wilderness another field, rich with the plant food which had slowly accumulated for ages. And even when the limit was reached in our Central States, the great West, with its countless acres of the richest soil, was waiting to welcome him. Under these conditions, our system of farming grew to be a wasteful one, and for many years the yield of crops declined on much of the land that had been long under cultivation.

For some years past, there has been a gradual change for the better in our system of farming. Farmers are beginning to ask earnestly: "How can we maintain or increase the fertility of our lands?" and many old fields have been brought back to a yield which equals that of the days of their virgin fertility. I think there are farmers who honestly believe that the legitimate and inevitable result of farming is to exhaust the soil, and that a

farm, like a piece of machinery, will wear out and become worthless. The problem we are called to solve is, to restore fertility to lands already impoverished, and to so manage our farms as to maintain or increase their productiveness.

In doing this, we are to make use of:

Home-made manures;

Green manures;

Rotation of crops;

Pulverization;

Commercial manures.

I have arranged these somewhat in the order of their importance and value to the farmer, although it is a little difficult to give each one its relative position. They are all of exceeding importance, and largely dependent upon one another, and may all be combined in farm management. The first four certainly cannot well be separated. I have put commercial manures last, because I believe that home resources should be utilized before money is spent to purchase plant food.

HOME-MADE MANURES.

How shall we get the most?

How shall we manage it so as to have it in the best condition?

How and to what crops shall we apply it?

Under the system of farming generally practiced, a very large part of the manure is wasted. The barn-yard is not arranged with reference to saving manure. It should, while large enough to accommodate the stock, be small enough so that it could be deeply covered with straw, or the waste of the corn fodder, so as to retain the

liquid, and should be so shaped that water could neither enter it from the adjoining land, or flow from it. To this barn-yard should be brought all the straw and corn stalks on the farm, and instead of allowing the cattle to tramp over the fields pasturing off the stalks through the winter, they should (when not in the stables) be kept in here from the time grass fails in the fall until turned on pasture in the spring.

The farmer growing an average of forty or fifty acres of corn and wheat each year, and who has followed the old plan of stacking his straw in the woods, and pasturing his stalk fields, will be astonished at the bulk of good manure he can save in a year if this plan is followed.

I would recommend that the stable floors be made water-tight, and enough bedding used to save all the liquid, and that the manure from the stables be wheeled out and spread evenly over the barn-yard, so as to be mixed with the coarser material. This barn-yard is to be the farmer's chemical laboratory, where the waste material of the farm, and that which is offensive is transmuted into gold.

While the barn-yard is the main, it is not the only, source of fertilizers on the farm. Both the poultry-house and privy supply a fertilizer nearly or quite equal in value to the commercial fertilizers for which we pay $30 to $40 per ton. Either of these may be prepared for use so that they will be as pleasant to handle as dust from the road, and make a powerful and valuable manure. I think that the manure from a dozen fowls will amount to a barrel or more a year, and in an experiment I made two years ago on wheat land, one barrel of hen manure, finely pulverized and drilled in with the wheat on an acre, gave as heavy a crop as the adjoining acre with twelve loads of stable manure. The contents of the

box under the privy and the droppings from the hen-roost should be taken up every week and thrown in a bin prepared for the purpose, under cover, and enough dry earth scattered over it to prevent any escape of ammonia, and four weeks before it is wanted for use, it should be moistened with the strongest manure water you can get, so as to cause fermentation. If it is partly decomposed, so that it will not ferment readily, add one-fourth its bulk of wheat bran—which is of itself a cheap and good fertilizer—and a violent fermentation will at once take place. When you wish an active fermentation with manure of any kind, pile it up in a conical heap. As soon as this is thoroughly hot, level it down to six or eight inches deep, scatter a little plaster over it and turn it every day, beating it with the shovel so as to make it fine. In a week or so, sift it through a mason's sieve, and if there is much that will not pass through, mix a little more bran with it, wet up and heat, and go through the same process again. This makes an exceedingly valuable manure, especially to use in the garden, or in the hill for melons, and when dry it is oderless. It also feeds through the fertilizer drill as readily as bone meal.

What I have said above about stable manure relates mainly to quantity. I wish to recommend the thorough fining of manure, that its quality and availability may be improved. We should recollect that manure can only be assimilated by the plant when soluble, and that decomposition is much more rapid in the compost heap than in the soil. Many farmers object to the labor of turning and handling manure in the barn-yard; but as manure is valuable, not for its bulk, but for the available plant food it contains, I am convinced that by turning and fining we can so reduce the bulk and increase its availability as to more than pay for the labor. Manure,

tramped down in the stable or barn-yard is impervious to air, and fermentation is suspended, and when we wish to prepare it for use, we fork it up, so as to admit the air and start fermentation. It is best always to do this after a heavy rain, as moisture is necessary.

If the manure is wanted for a hot-bed, or we want the quickest fermentation we can get, make the heap conical and six or eight feet high, but it must not be left many days in this shape, or it will fire-fang. The best plan, where a slow decomposition is wanted, is to make the heap four feet high and perfectly flat. In from ten to twenty days this manure may be turned again, and these handlings will reduce its bulk at least one-half—if it was coarse and strawy—and will make it of uniform quality, and quickly available to the plant.

During many years's experience as a gardener, I have had occasion to test this matter of thoroughly decomposing and fining manure, and I believe that a load of good stable manure, so finely pulverized that it could be sifted, applied to a half acre, would produce a heavier growth, particularly of small grain or grass, than four loads of equally good manure, spread on as it is ordinarily applied.

After considerable observation and experiment with manure, I have come to the conclusion that I get a better return from it when applied at the surface, and that it pays better when applied to wheat than to other field crops. Manured wheat is rarely a failure. Fly, frost, rust, chinch bug, and other enemies soon overcome a wheat plant which already lacks vitality and vigor, but rarely a vigorous one grown on a well manured soil; and this is to be taken into account in estimating the value of manure. Another reason why I like surface manuring for wheat is that the young plant may immediately

feel its benefit and make a good start for winter. When the manure is plowed under deeply, the wheat gets but little benefit from it the first autumn, just when it most needs it. Still another reason for using manure on wheat and as a top dressing is, that it assists us to grow a clover crop at the same time the wheat crop is growing, and this clover crop is a grand pulverizer and fertilizer. There is little difficulty in bringing run-down land to a high state of productiveness if we can get clover to grow on it, and a light dressing of manure at the surface makes a capital seed bed for the clover. The farmer who follows a system of rotation of crops, uses all his manure on wheat, and always sows clover with his wheat, will not need manure on his corn crop, and will rarely if ever fail to be paid for his manure from the first wheat crop.

GREEN MANURING.

If asked which I considered the most important to the farmer, stable manure or green manures, I should answer, "This ought ye to have done, and not have left the other undone." I should not be willing to farm without either.

There is this in favor of green manuring, that there is very little labor about it, and we avoid the dirt and disagreeable odors which stable manures always have. I have experimented enough with clover to lead me to determine that the second growth, plowed under in July, after the first crop has been either cut for hay or pastured, is worth to the succeeding wheat crop as much as a dressing of ten loads of manure per acre. The difference in the cost of fertilizing by these two methods is great. Clover seed must be unusuallyhigh if the cost of

seeding is over $1 per acre, while the cost of hauling and spreading ten loads of manure, even if on the farm, would be about three times this, and the actual cost of manure applied to the field, will rarely fall short of $1 per load, and often exceed it. One of the fairest tests I ever made of the comparative value of stable manure and clover was on some impoverished land on which I have been experimenting for some years. As I shall devote a short section to this land, I will not give the details here. I recollect a remarkable yield of corn from clover manuring about 1861. I owned a field of cold clay land on which I found it difficult to grow paying crops. Corn rarely made over twenty-five bushels to the acre; but one year, when wheat was nearly a failure, I had a splendid growth of clover. I did not pasture it in the fall or the following spring, and by the first week in May it was six inches high. I turned it under and had fifty bushels of excellent corn to the acre, which, knowing the quality of the land, was a surprise to me. As I think over my experience with clover as a fertilizer, I can say I have never been disappointed with it. Some fail to get much benefit from it because they pasture it the first season while it is young and tender, or turn on it in spring, and feed it off so short that it never makes growth enough to shade the soil or develop its roots properly. I shall devote a chapter to clover, in which I shall more fully discuss its value and proper management. My practice has been ever since I began farming, and my advice to all is to sow clover with every acre of small grain. It is the cheapest and best fertilizer in America.

Another valuable plant for green manuring is rye. It can be grown between two crops of corn, and so costs nothing for rent of land. It will attain its full growth

so that it can be plowed under from the first to the twentieth of May, according as the season is early or late. I have found the corn crop largely increased the second year after I had plowed in a crops of rye, and its mechanical effects are very marked and beneficial. As I intend to devote one chapter to "Rye on the Farm," I will leave it for the present.

Another crop which is worthy of careful experiment for the purpose of green manuring is corn. A very heavy growth can be made in a few weeks; and when clover fails, the wheat stubble may be plowed and corn sown, which will attain a heavy growth before frost. I have grown twenty tons, green, per acre when sown July 23rd. A neighbor two years ago tried this experiment, plowing the crop under as soon as the frost killed it, and was much pleased with the result, the corn on the field next year showing to a row by its rank growth, where the green crop was plowed under.

Buckwheat makes an exceedingly rapid growth, and has an excellent effect in pulverizing stubborn soils. It has been claimed by experimenters and scientific men that buckwheat, when plowed under, destroys insects in the soil. This is a matter worthy of consideration and careful experiment.

I would recommend the following experiment in green manuring on exhausted land: Seed heavily with rye in autumn; plow this under when in bloom and seed with buckwheat, and as soon as this was large enough plow it down and sow four bushels of corn to the acre and plow the latter under as soon as killed by frost.

There are millions of acres of land cultivated from year to year that do not yield a cent of profit—many of them at an actual loss—and for which it is impossible to get manure; and if they can be renovated by green

manuring, it is time farmers knew it. I doubt if one farmer in ten thousand can tell whether it would pay to give a field the treatment I suggest; and yet how easy it would be to experiment with a single acre and settle the question.

The benefit from green manures seems to be more than the actual plant food they furnish, for their mechanical effect opens the soil to atmospheric influences, and in some way which I cannot explan, the simple shading of the soil enriches it. Harlan, in his book on FARMING WITH GREEN MANURES, alludes to this, and tells of an English farmer who, leaving a door lying on a fallow field for several months, found that for several years the crops were heavier on that spot, as though some rich manure had been applied. The great benefit of clover is supposed to be partly due to the dense shade it gives to the soil. Whatever is the cause of the increased fertility, whether actual plant food, chemical action of the decaying plants in the soil, the mechanical effect, shade, or all combined, the fact remains that green manuring offers a cheap and satisfactory method of increasing the fertility of the soil, and especially of restoring worn-out lands, and the wise farmer will push his investigations in this direction.

With all that has been said in favor of green manuring, I would not give the impression that the farmer who follows this system would thereby be justified in allowing the manure from the barn-yard and other sources to be wasted; but the best results will come from a combination of the two, using the stable manure with reference to growing a fertilizing crop.

COMMERCIAL MANURES.

It is only within a few years that these have been used

to any extent on Western farms, and it is doubtful if one farmer in twenty has used them at all. In most localities they have now gained a foothold, and their sale is rapidly increasing. I wish first to correct a misapprehension concerning them which I find prevalent among farmers, namely, that they are only stimulants and that their use, while it will produce increased crops for a while, will ultimately impoverish the soil. This is a mistake, for commercial fertilizers furnish plant food, and cause an increase of crops in the same way as stable manure. The error of supposing that they are only stimulants has probably arisen from the fact that they do not, like stable manures, furnish all the necessary elements of plant food. By the continued and exclusive use of a commercial fertilizer containing some particular element of plant food and deficient in others, heavy crops may be grown which will ultimately exhaust the soil of those elements wanting in the fertilizer. The remedy for this trouble is to change the fertilizer, selecting one rich in those ingredients which were wanting in the preceding one.

Commercial manures are not intended to take the place of stable manure, but rather, to supplement it; and the farmer should save and apply all the home-produced manures before spending money for others. Again, I would not advise any farmer to invest largely in commercial manures until he has tested them on his own land, for they are not as uniform and certain in their action as stable manure.

No farmer should purchase commercial fertilizers with his eyes shut, but should consider carefully: Is this fertilizer the one my soil needs? Is it adapted to the crop I am growing? Is it worth the price charged for it?

The valuable constituents in all these fertilizers are

ammonia, phosphoric acid and potash. A convention of agricultural chemists has considered this question, and agreed upon a standard valuation of these articles, so that any farmer knowing the amount of each of these in any given fertilizer, can arrive at a reasonably correct knowledge of its value to him.

One great advantage of using commercial manures—on soils where they give good results—is, the ease with which they are applied. With a drill with fertilizer attachment it does not cost anything to apply the manure, for you can drill as many acres of wheat a day as you could if not using the fertilizer. At present a fertilizer drill costs about $25 or $30 more than an ordinary one, but a manufacturer of my acquaintance has just patented an improvement which he thinks will enable him to offer a first-class drill with fertilizer attachment at a few dollars above the cost of an ordinary drill. This drill will be tested before this book goes to press, and if it proves satisfactory, it will probably be advertised in the last pages of the book. With the rapidly increasing use of bone meal and other commercial fertilizers, and the excellent results from their use in many cases the wise farmer who is purchasing a drill, will get one with fertilizer attachment, so that he will be prepared to use these fertilizers if he finds them profitable. Poultry manure can be easily prepared as I described in a former chapter, so as to be drilled in. I have recently been in correspondence with a manufacturer who is getting up a hand mill for grinding bones, who claims that he can furnish a cheap mill with which a man can grind from 50 to 100 pounds of bone an hour and with which dry manure of any kind can be reduced to powder. If this can be done, such a machine will certainly be exceedingly valuable. Bone meal is rich in phosphoric acid which is

the element most needed for wheat and is the most lasting in character, and will benefit the succeeding crop, particularly grass or clover more than the superphosphates, but the latter are usually more soluble and quicker in their action and will give the wheat a quicker start in the fall, which is an advantage in getting it well rooted for winter. I know there are localities where the wheat crop has been doubled by the use of these fertilizers, and every dollar expended for them has returned two or three. My advice to every farmer is, to experiment with them, and if you cannot get a fertilizer drill use them broadcast and harrowed into a mellow surface. This was the way I first tried bone meal, and I found as good effects from it as when drilled in with the wheat.

Although bone meal and superphosphates are the principal commercial fertilizers, there are others which may often be used with profit. In soils in which lime is deficient, it can often be used to great advantage. All plants contain it, some of them in large quantities, it being found in straw, hay, leaves of fruit trees, peas, turnips, etc., and constituting more than one-third of the ash of red clover.

Lime has other uses besides furnishing the plant what it needs.

It counteracts sourness in the soil. It aids the decomposition of vegetable and animal matter. It breaks down the mineral particles, and by these means prepares different parts of the soil for the use of plants. It is said to exhaust the soil, but it only does it by producing larger crops, as explained elsewhere in connection with other commercial fertilizers, and the remedy is the same. Lime is an alkali and corrects the acidity in soils by uniting with and neutralizing the acids. Lime hastens the rotting of organic matter in the soil, but should never

be used in the compost heap, as it liberates the ammonia and allows it to escape. Lime varies somewhat in its composition, and as a rule, that which makes the best wall plaster is best for the soil. One other fact in connection with the use of lime is, that it has a tendency to sink in the soil, and should always be applied at the surface.

SALT.—This article is valuable as a fertilizer on some crops and soils. It furnishes some portion of plant food and by chemical action in some soils renders materials already present available. One benefit from its use is that it stiffens the straw by rendering soluble the silica in the soil, and thus enables a crop of small grain to stand and ripen which without it would lodge. It may be sown on wheat in the spring at the rate of three or four bushels to the acre, and is also valuable in the compost heap at the rate of a peck to the cord, as it will hasten decomposition and destroy both weed seeds and insects. Salt for fertilizing purposes may be had at a small cost from packing houses or tanneries, and it is more valuable than the fresh article.

One other commercial fertilizer is gypsum, or land plaster. It is a constituent of many plants, and is an excellent absorbent of ammonia and useful to sprinkle in stables, poultry houses, privies, etc., where it absorbs the escaping gases, saving them for fertilizers and purifying the air. When used as a fertilizer it should be applied to growing crops and in small quantities, one hundred pounds to the acre being a sufficient dressing. It is best to sow it when the dew is on the grass or on a damp day so that it will adhere to the leaves. The most notable advantage in plaster is obtained in its use on the clover crop. Sown on this it not only largely increases the crop but increases its value as a fertilizer. An interesting

statement was made by a farmer at an agricultural meeting which I attended, which was, that an application of a mixture of two parts of plaster to one of salt, at the rate of a barrel to eight acres saved his corn from the cut-worm and largely increased the yield. The corn was on sod and the cut-worms kept it eaten to the ground before the application and continued to work on a part of the field on which the mixture was not applied, but in twenty-four hours had entirely disappeared from the part treated.

PULVERIZATION.

There is an adage that tillage is manure; but it is only of late years that the value and importance of thorough pulverization of the soil has begun to be appreciated.

There are two ways in which pulverization increases the crop: First, by enabling the plant to readily obtain from the soil the material it contains. Second, by actually increasing the amount of plant food in the soil. The latter is the one we have to do with in this chapter, and there are two scientific principles that must be understood before this matter can be made clear.

Certain solid bodies possess the property of absorbing or taking up great quantities of gases and retaining them. Dry earth possesses this power in a remarkable degree, and the extent of it is in direct proportion to the minuteness of its division. The best possible disinfectant is now known to be dry earth, reduced to an impalpable powder; in this form it completely destroys poisonous odors and gases by absorbing and retaining them in an innocuous form. Earth, in hard lumps, does

not possess this property in any perceptible degree, and a handful of dust is of more value as a disinfectant than a bushel of clods.

The next principle is what is called capillary attraction. This is the power that porous bodies have of not only absorbing but of drawing up liquids. It is the principle that causes the oil to rise in the wick of a lamp. The power of porous bodies to thus elevate liquids is exactly in proportion to the fineness of the pores. Hang a piece of coarse twine and a piece of very close, fine twine with the end of each dipping into a vessel of water, and it will be found that the water will rise much higher in the latter than in the former.

A porous soil possesses this power of capillary attraction, and hence can, during a dry season, draw up water from the moist subsoil below, exactly as a wick draws up the oil from the lamp, and its power to thus draw up moisture will be in exact proportion to the number and fineness of the pores it contains. It can be seen in a moment that the more thoroughly the soil is pulverized, the more pores there will be through it and the smaller they will be. A field of large clods will have comparatively few openings to the subsoil below, and these openings so large that they have no power to draw up the lower moisture. A field of finely pulverized soil, on the other hand, will contain myriads of extremely minute pores, that will act like so many pumps.

Now let us see how these two principles of "Absorption" and "Capillary Attraction" combine to fertilize the well pulverized soil, and make true the statement that "tillage is manure."

There are two great original sources of fertility, and from these, at some time, all fertility must come — the air above and the soil beneath. Ammonia, and other

substances essential to plant life, are constantly present in the atmosphere. The proportion is minute, but fully sufficient, if secured, to make rich and productive fields. Now, under the principle first laid down, of the power possessed by finely pulverized earth to absorb and retain gaseous matters, it will be seen that a field, the surface of which is constantly kept finely pulverized, will be as constantly drinking up fertility from this unfailing source, and that tillage will thus be continually increasing the amount of plant food in the soil.

But we consider the other permanent source of fertility — the subsoil. In this, decomposition is slowly but surely progressing, and plant food is being set free in an available form; the moisture of the subsoil is constantly charged with useful salts. If we can but draw these up within the reach of the crops, we shall again increase the supply of food in the surface soil.

Thorough pulverization of the soil, by bringing into play the principle of capillary attraction, will draw up this moisture, with its fertilizing salts, and thereby enrich the surface soil,

To test this matter, take two boxes, spread in the bottom of each a couple of inches of wet earth; then in the one put about three inches of small hard clods, and in the other three inches of finely pulverized, dry, mellow soil. In but a short time, the earth in the latter box will be found moist to the top, while the clods will scarcely be affected.

Pulverization acts as a fertilizer in yet another way: Chemical decompositions are constantly taking place in the soil, by reason of which material that has previously been valueless, is made available as plant food. The more finely the soil is pulverized, the more rapidly and thoroughly will these changes take place.

We find, then, that "tillage is manure," because:

The finely pulverized soil absorbs valuable elements of fertility from the atmosphere;

Because it draws up fertilizing material from the subsoil below; and

Because it makes available, material already existing in the soil.

ROTATION OF CROPS.

This may at first be thought to belong to the matter of cultivation, but a closer examination of the subject will soon demonstrate the fact that rotation, as well as pulverization, is a real method for increasing the fertility of the soil, and therefore may properly be considered under the head of "Fertilization."

Every farmer knows that if a certain crop is grown year after year on the same field without change, rest, or the addition of fertilizers, that the yield will continually decrease until the soil will at last refuse to produce this crop at all.

It is also known that if, after a soil has been thus injured, it be allowed to lie idle for one season, a portion of its fertility will return, and the same crop will grow again. From this arose the plan of allowing a field to lie "fallow."

But it has also been found that after a field has been exhausted by continuous cultivation of one crop until it will produce that crop no more, a different crop may be successfully grown. The reason for this latter fact is very simple and easy to be understood. Each plant draws from the soil certain elements of fertility — elements which, though absolutely essential to plant-life,

form but a comparatively minute portion of the soil. Continuous cropping with one crop may, therefore, so completely exhaust the soil of those elements necessary for that crop that no more can be grown. But different crops differ in their needs, and after a soil has been exhausted of the elements necessary for the growth of some one crop, it may still contain the elements needed by another. This explains why a crop may be grown on a soil that has been exhausted by another; but it does not yet explain how it is that after the second crop has been grown for some years—even without the addition of manures by the farmer—the soil will be found to have regained, in a measure, its capability for producing the first crop.

The reason is that Nature is continually laboring to restore the ravages produced by the hand of reckless man. Locked in the soil, and especially in the subsoil, are almost inexhaustible sources of fertility, which, by the forces of chemical decomposition continually going on, are slowly but surely being unlocked and prepared for future use. The rains and dews bring needed elements from the air above, and the absorptive power of the earth is continually gathering them. Thus, even while one crop is growing, Nature is preparing the soil for another. Thus we see that rotation is a real though slow process of fertilization. It is, in fact, the method by which the farmer may avail himself of Nature's recuperative powers.

If, in addition to this, the rotation is accompanied by the application of barn-yard or commercial manures, and includes every few years a crop like clover, that is especially adapted to draw from the air above and the earth beneath, food needed for other plants, we see how rotation can be made one of the most useful means of

fertilization which the judicious farmer can control.

What constitutes a good system of rotation?

This must vary with every locality and every soil. What would be the best rotation in one place might be totally inapplicable in another. Over a large section of our Western country rotation will usually include corn, wheat, oats, clover and, probably, grass.

Let us suppose the farmer has a soil well adapted to diversified farming, as in the larger portion of our Western land. He can make a good rotation as follows:

First year, corn;

Second year, corn;

Third year, oats, flax, or spring barley, followed by wheat in the fall;

Fourth year, sow clover on the wheat in the spring; harvest the wheat and leave the clover to grow;

Fifth year, either pasture or mow the clover, allowing a good growth to form and ripen in the fall, ready to be plowed under the

Sixth year, for corn, when the rotation begins again.

This rotation may be shortened, by seeding down to wheat among the corn, in the fall of the second year, and omitting the crop of flax or spring grain. But, as in some sections of the country wheat on corn land is less certain and less productive than on stubble ground, it is best in such localities, if the spring crops can profitably be grown, to include them in the rotation.

There are some farms specially adapted to wheat-growing, and on which it is the most profitable crop. On such farms, the wise cultivator will of course arrange his rotation so as to bring in wheat as often in a given number of years as possible, without injury to the soil. The rotation should include but a single crop of corn, which, if in a section where it can be done, should

be seeded to wheat in the fall, and by the use of barn-yard or commercial fertilizers, the course may consist of four years—one crop of corn, two of wheat and one of clover.

The rotation can be lengthened by sowing timothy with the wheat in the fall, following with clover in the spring, cutting two crops of mixed clover and timothy, pasturing one year, and then breaking for corn again.

One most excellent farmer of my acquaintance, who has a large tract of land specially adapted to corn, has pursued the following rotation, with the result of largely increasing the productiveness of the land, and at the same time securing heavy crops: Two crops of corn are grown; the second fall the corn is cut up, and the land seeded in wheat; clover is sown on the wheat the next spring and left to grow after harvest. The following summer, after the clover has attained a good growth, hogs are turned on and kept on it all summer. In the fall he feeds the hogs on the field, having the corn scatterered in a different place each day, and the cobs and droppings of the pigs are thus spread evenly over the field. The following spring he breaks again for corn, grows two crops and follows with wheat, clover, hogs, as before.

At what point of the rotation should the manure be applied?

This is an important question, and one which each farmer must answer for himself by the use of thought, observation and common sense. There is no place where empiricism is more ruinous than on the farm. Farmer A. plows his manure under for corn, and succeeds, and Farmer B., with a totally different soil, very illogically concludes that the same plan will be successful with him. Farmers who would have success in farming,

must learn to study the reasons for certain actions.

The opinion of many of our best farmers is, that the best place in the rotation for the application of manure is on the wheat crop, used as a top dressing shortly before seeding. The reasons for this are given in other sections of this chapter. In some cases, as where the soil is naturally rank—as in some of our bottom farms—such application may prove actually injurious, causing the wheat to grow too sappy and succulent, and lodge. In such cases it is often best to use the barn-yard manure as a top dressing to the corn crop, and use bone meal, or super-phosphate, drilled in with the wheat.

There are cases—in heavy, cold, retentive soils—where the coarse manure may profitably be spread on the field during winter and plowed under for corn. Its mechanical action loosens the soil, while the retentive character of the land prevents undue waste. On light, and especially on leachy soils, the plowing under of coarse manure is undoubtedly a wasteful and unprofitable practice.

Land plaster (gypsum) when attainable at a reasonable price, may almost always be profitably applied to the clover crop. Sown broadcast in the spring, it deepens the color, increases the growth, and usually has a marked beneficial effect on the succeeding crop of corn.

EXPERIMENTS WITH MANURE.

Before leaving the subject of fertilization, I wish to suggest some experiments easily tried, and mention some which I have tried. It is a matter of interest to know what a load of manure is worth on the different

crops, and one or more experiments each year in this line will be profitable. Manure, like certain funds once used in Congress, should be placed where it will do the most good. Calling a half cord of rotted, well composted manure a load, apply it to a tenth of an acre of each of the different crops, and then compare with an equal unmanured plot and see what the increase is. It might be well, on such crops as potatoes and corn, to try applying it broadcast and in the hill, making that used in the hill cover more land. Another experiment, and one especially to be tried with wheat crops, is plowing under the manure on one part, and using it as a top dressing on an adjoining one.

The fining of manure is another thing that should be made a matter of experiment. Put a load of manure in the usual condition on a tenth acre, as a top dressing for wheat, and then pulverize as fine as possible an equal amount and apply to just double the amount of land. If you get the manure almost fine enough to screen, I think you will find a larger yield of wheat from half the amount of manure when finely pulverized.

Another experiment to show whether it will pay to have sheds for our manure, would be valuable. Take a load of manure from a stable, where it has been allowed to accumulate, and which contains the liquid as well as the solid, and apply it alongside of a plot manured with that from the barn-yard. It is often a question with the farmer who has a ten-acre wheat field to sow, and fifty loads of manure for it, whether it is better to manure one-half and leave the remainder unmanured, or to give a light coating to the whole field. This is a very important matter, and one that should be fully settled by repeated experiment.

Every farmer should know what effect bone-meal,

super-phosphate, and other commercial fertilizers at his command will have upon his soil, and this he cannot know except by actual test. If $3 worth of bone will give $5 to $10 worth of extra wheat on an acre, as without doubt it does on some soils, he can then afford to apply his home supply of manure to less land, and use ground bone on the remainder.

In estimating the value of manure, we are to take into consideration: First, the increased yield of the crop to which it is applied. Second, its effect in enabling a crop to resist enemies. Third, the increased earliness of the crop, and its greater value on this account. Fourth, the length of time that the manure will act on crops, either directly or through a fertilizing crop which it enables us to grow. In order to test the first, we should always leave a strip without manure to compare with. The second item is of greater importance than many imagine, for the extra vitality which manure gives will enable a plant to successfully resist what would be fatal to a weak, sickly one. We often see this in a wheat field on impoverished soil, where one part of the field has been manured. While the unmanured part is winter-killed, or destroyed by the fly, or eaten up by chinch bug, or blighted by rust, the part manured resists each and all these malign influences, and makes a good crop. The same thing may be seen in growing potatoes. I have never seen the Colorado beetles injure materially the crop on highly manured land. When the season was good and they were well cultivated, the vines would grow right away from the bugs; but let the soil be poor, or cultivation neglected, and the Colorados soon have the mastery. The advantage of manure in hastening the maturity of crops is of greater importance to the gardener than to the farmer, as the prices of his products

are largely determined by their earliness, two or three days' difference in the maturity of the crop sometimes making a difference of one-half in the price. It would be an interesting experiment, particularly on our strong, clay, limestone soils, to ascertain how long the effects of manure could be noticed on the crops, and thus to be able to give a better idea of the value of manure. This could be easily found out, at least approximately, by growing crops on a manured plot, and by the side of it on an unmanured one, and following it up, weighing the product of each as long as they showed any difference. You would at the same time be finding out the value of your load of manure. These experiments should include nightsoil, poultry manure, land plaster, or anything available, which promises to furnish directly or indirectly, food for the plant. Tanbark can be burned, and an ash, rich in phosphoric acid, formed. Sawdust can be carbonized by burning in pits, like charcoal, and may be exceedingly valuable on some soils. Those living near elevators, where thousands of bushels of corn-cobs accumulate, can experiment with them by composting or burning. And if we keep our eyes open, we shall find in almost any locality waste products which we may utilize.

I have been much interested in burning straw or stubble on the surface, especially where land is to be prepared for wheat. I have experimented to some extent, and am convinced that all straw that can be spared can be used profitably by spreading it on the surface and burning. It should be spread thickly enough so as to burn the soil a little. I shall give an account of some experiments with various manures in a chapter on experiments with wheat.*

*Burning straw spread on the ground is certainly an immense improvement on the custom adopted in some parts of the West

I tried an interesting experiment with wheat bran as a manure two years ago. I mixed fifty pounds of bran with an equal bulk of rich mould, and wet it with leachings from the manure pile. As soon as it had heated, I leveled off the pile and stirred occasionally until the heat had subsided, and in a few weeks it was thoroughly decomposed. I planted a half acre of Peach-blow potatoes on a poor clay knob, on which corn did not make over fifteen bushels per acre the previous season. I manured alternate rows with a single handful of this prepared bran to the hill, using at the rate of five hundred pounds of the bran to the acre, and as bran cost but $10 per ton, the cost, besides the labor, would have been but $2.50 per acre. By the time the potatoes had been planted a month, the rows treated with the bran were six inches taller, and of a better color, and all through the growing season the difference in the rows was plainly discernable. At digging time I took a pair of steelyards to the field, and would dig down a manured row till I got a basket full and then weigh and empty them, and dig back on the unmanured row. I cannot now refer to the record which I made of this experiment; but I remember that several times the manured row gave

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of burning it in the stack, or of thrashing on the bank of a stream and allowing the straw to be floated away. The most valuable constituent of straw is the mineral portion, which, of course, is left in the ash, and when the straw is burned on the surface of the field this is left in a very available form. But all this is secured when the straw is rotted in the manure pile, and much nitrogenous matter is also saved that is inevitably lost when the straw is burned. It is therefore chemically certain that a ton of straw has a greater manurial value when rotted in the manure pile, than when burned. And when we consider the incidental value of straw in absorbing and retaining the liquid portion of the manure, I think it will be seen that it must be under very exceptional circumstance, and on farms where the amount of stock kept is very small, when it will pay to burn straw. R. S. T.

double, and in no case less than a half more, while the quality was very superior. The extra potatoes produced in the rows on which the bran mixture was used did not cost eight cents a bushel.

This question of experimenting with manures is one of great interest, and every intelligent farmer should do something in this line each year. A record of such experiments becomes exceedingly valuable to refer to.

Farm experiments are valuable in their influence on the man, in making him more accurate and observing and familiar with the mysterious works of nature. They are also absolutely necessary to the proper understanding of what is best to do on his own farm, as soils and conditions vary to such an extent that the experiments of another, under different conditions, may not be beneficial to him.

MY OWN EXPERIENCE.

BRINGING UP A RUN-DOWN FIELD.

As I know farmers like to see theory put to a practical test, I will give an item of my own experience in the matter of restoring lost fertility. In the year 1877, I bought at a low price fifty acres of worn land. I had lived adjoining it for nearly thirty years, and had seen every crop grown on it in that time, and, as nearly as I can recollect, it had not once produced over twelve bushels of wheat or twenty-five of corn to the acre. It had received little or no manure, and when seeded to grass or clover was usually so overstocked as to receive no benefit. Twenty-five acres of it was level enough for good plow land, but was divided diagonally by two wet

strips which could not be plowed. When I bought it, it was rented for the season, and every available foot of it plowed for corn so I did not get possession till the fall of 1877. The crop on it for that year was like all I had seen before, very poor, the corn making about twenty bushels to the acre, and as the season was a wet one the ground was covered with a heavy growth of foxtail. We sowed seven acres in wheat where the corn had been cut up, and, on accout of the foxtail, got it in badly, and the result was but four and a half bushels to the acre of inferior grain, but a good stand of clover. In the spring of 1878 we sowed fifteen acres in oats, and put the remainder in corn, potatoes, and beans, but the only encouraging feature of this year was that on the oats and wheat ground we got a good stand of clover and grass. That fall I laid eighty rods of tile and sowed eleven acres of wheat where beans, potatoes and corn had grown. We manured one half of it with barn-yard manure, used a little bone meal, and put it in as well as we could, and our wheat from this field was 241 bushels or about 22 bushels to the acre. We got a fair crop of clover hay on ten acres of the land where the poor wheat and oats had grown; laid fifty rods more of tile in the last wet strip, and in July plowed up twenty one acres for wheat. Eleven acres of this was the same that had yielded the twenty-two bushels of wheat to the acre, and the balance was clover stubble and included the seven acres of land that grew the poor wheat crop in 1877. I should not have plowed the eleven acres but on account of a dry spring we failed to get a stand of clover. We hauled out manure and top-dressed the part of the eleven acres that had not been manured the preceding year. Our wheat crop was good, averaging over twenty bushels per acre, but that on the clover stubble was very

much heavier than that on the wheat stubble where the manure had been applied, and we had a fine stand of clover on the entire field.

The fifty acres of land is now divided into two fields. The broken part, which has never-failing springs, is seeded down for permanent pasture, and we have this fall, 1881, sown twenty-five acres of wheat on the level part, and it promises well for a crop. I think I have fully doubled the value of the plow land, and notwithstanding the first crops grown were so poor, the land has paid a fair interest on capital invested. It will thus be seen that in the short space of four years, a piece of land so worn as to be of little value, has, by tileing, rotation, a moderate use of manure, commercial fertilizers and clover, been brought to a condition of reasonable fertility, and at the same time has yielded crops that have paid the cost of the improvement.

CHAPTER VIII.

HIRED HELP.

With all modern improvements there is still enough work to do on the farm to make the "hired help" problem one not easy to solve. If the farmer determines to do without hired help, he is pretty sure to overwork and neglect many things that are necessary. One man on a farm of any size is not enough, for there are so many jobs to be done around the house and barn, in the garden, repairing fences, making errands to town, etc., that the team must stand idle much of the time or these necessary things be neglected. The farmer who attempts to do all his farm work and care for his stock, will have no time or heart for anything else. He will be too wearied to read or even to converse when night comes; and life will have little meaning to him. His lot will be harder than that of a day laborer, for in addition to his work he will have the care and responsibility of the farm resting upon him.

There is still another view of this subject. The world is full of people who can never rise above the condition of laborers, and who are dependent for support upon the labor of their hands, and it is wiser and better than charity, to give employment to such. Every man who gives to another employment at a fair compensation, is a public benefactor, and has a right to make a profit from the labor so employed.

No one can hope to acquire much property simply by

his own manual labor. It is only as he has the capacity to employ and direct the labor of others that he can expect to realize a competency.

I believe the Bible clearly teaches the duty of making money. It is taught in the parable of the talents, and when we are exhorted to be "diligent in business," it becomes both a duty and a privilege to use our ability in making money. The more labor we can profitably employ on our farms, then, the better it is for our families and the community.

But there is another side to this question, and that is the care and labor which must often come upon the wife from bringing hired help into the house to board, and thus increasing the size of her family. No success in farming, or increase in wealth, will pay the man for working his wife into the grave, or breaking down her health. It is better that the farmer should hire married men who will board themselves, if his wife is not able to do the work; and this can often be done as cheaply as hiring single men, if you can furnish the man a house and garden.

In any case, I believe that it is best to pay fair wages. I doubt if anything is made in hiring a man by jewing him down to the lowest point. The man who feels that he has been treated badly in the bargain made, will not be likely to work with much enthusiasm.

While I would advise that a memorandum be made, covering all the points of contract, experience has taught me that it is not wise to make a contract for a given time. I do not want to be obliged to keep a hand that proves dishonest, immoral or inefficient; and I do not want a hand bound to me who is dissatisfied. I think it better to have it so the relation can be severed by either party at any time. I like, however, the plan of a

bonus in case a hand is trusty and faithful; but it should be a bonus and not wages which he can claim.

Suppose that a hand is hired for eight months at $16 a month, with a memorandum that either may terminate the engagement on a week's notice. After the bargain is made, you say to him: "If I find you faithful and obliging, I shall pay you ten cents a day extra for every day you work. If I do not find you so, I shall not keep you; so if you work for me until the eight months are expired, you will get this amount." By doing this, you are giving him a motive to do his best. The extra ten cents a day will amount to quite a sum in the eight months—enough to buy a good suit of clothes.

It is wise to have a frank and full understanding with a work-hand at the start, as to what you expect of him; and what must, and must not, be done. For example, some hands are cruel to horses. It is better to tell a hand at the start that your team is not to be whipped. Some young men think they have a right to go to town every night, and come into the house at midnight, disturbing the family, or get back at breakfast-time in the morning, after the chores are done. If you do not choose to permit these things, it should be so understood in the beginning. Where two or more hands are kept on the farm, there is often trouble and jealousy as to who shall drive the team, or as to what particular work shall be done by each. All these matters should be talked over in the beginning, and put in the memorandum.

If you expect a farm-hand to do any uncommon work, such as ditching, well-digging, or quarrying stone, it should be talked over and fully understood, or else he should have extra pay for it.

It would be well to say that in haying, or harvest, or occasionally when some job was pressing, you should

want extra hours work, but that you would always make them up by stopping work early on special occasions. The first thing necessary to get along pleasantly with hired help, is a perfect understanding between the parties, and all that is necessary afterwards is, to keep in mind the "Golden Rule."

A good employer goes far towards making a good hired hand.

On a farm where but one team is kept, by keeping a hired hand, the husband can have leisure to do much to relieve the wife. He can draw the water, carry in the wood, gather the vegetables, and do many things which will save the extra steps which wear out the wife and break her constitution. When extra work is caused by the hired man, unless good help can be found for the wife, the husband should consider it his duty to help her.

There is a great advantage in having a hired man on the farm, so that in an emergency you can do extra work. There often comes a week of wet weather, so that the ground cannot be stirred in the growing season. When the weather becomes settled and the land ready to work, everything is pushing. The weeds have started, and every foot of land under cultivation needs immediate attention. Perhaps a field of clover or wheat is almost ready to cut. Under such circumstances, a day's work is often worth five dollars, and as others are pushed as well, you may not be able to get help, unless you have it permanently.

There is one way of getting along without hired help, and that is by renting a part or all the fields for grain rent. I make a broad distinction between renting the farm and renting the fields. With human nature what it is, it is almost impossible to find a tenant who will keep a farm in good condition if left in sole possession.

The farmer who remains on his farm and rents out fields, whether for grain or money rent, keeps control of the land, and is on the farm to see that everything goes right. I like the plan of renting on the thirds, the landlord furnishing team, tools and seed, and the tenant the labor. This gives a young man a better chance for a start in life, and as he has an interest in the crop, he will naturally be more energetic and pushing than if hired. The farmer who wishes to try the experiment of renting, does not need to sell off his teams if he rents in this way, and if he is not pleased with it, can take the farm back under his own management without being obliged to buy teams and implements again. The farmer may not make quite so much money who manages his farm in this way as if he worked it all himself, but he will enjoy more of life and will be likely to keep his farm in better condition; and if he reserves ten or fifteen acres of his richest land on which he will do his best to grow heavy crops, he will not be in danger of falling into habits of idleness, and will probably find his profits as great at the end of the year as when he had the worry and care of the entire farm.

On a good farm I think an energetic young man can usually, farming on the thirds, make double what he can working by the month, and he will be more independent. Many of our wealthy and successful farmers began life in this way.

This matter of hired help or renting out our lands, is one of great importance, and one in which the farmer should always counsel with his wife, for her interest and comfort are often more concerned in the matter than his, and I believe that in a majority of cases her judgment would be better.

CHAPTER IX.

FARM IMPLEMENTS.

I doubt whether the young farmers of to-day appreciate what progress has been made in agricultural implements. They of course understand how perfect and well adapted to the work are the numberless inventions which make the term "farm drudgery" almost a thing of the past; but they can scarcely realize that only a generation ago it was common for a large farm to be managed with so few implements that twenty-five dollars would be an extravagant price for the lot.

Good crops were grown on the virgin soil when a shovel plow and clumsy iron tooth harrow were the only implements used, if we except a ponderous hoe made by the blacksmith, with which the sprouts around the stumps were cut down. Even when inventive genius first turned attention to the wants of the farmer, success was only partial, for the first reapers were clumsy horse-killing affairs requiring four horses and two men to do less work less perfectly than the self-raker of to-day does with two horses and one man, not to speak of the self-binder. The first corn-planter hardly foreshadowed those that were to come, and when in ransacking some barn-loft we find one of these old implements hidden away, they need to be labeled to enable one who has never seen them to know what they were designed for.

While with the improvement in agricultural implements more capital is required to manage the farm, bet-

ter culture for the farm, and I may add for the farmer and his family, is made possible. The life of the farmer need no longer be that unvarying round of drudgery it was a generation ago, for more can now be accomplished in one day than could be then in two, and certainly it is the farmer's own fault if he do not take time to cultivate his mind.

One thing seems to be settled, and that is, that all the demands of the farmer can be met by the inventive genius of the age, and there is no operation of the farm but what can be done, or at least assisted, by machinery. The prophecy of to-day becomes the reality of to-morrow; the progress of the past generation is more than that of the five thousand years preceding it. The farmer has but to make known a want and it is met.

I cannot attempt to catalogue the implements in use on the farm; doubtless there are many which I have never seen, and it is not the design of this article to describe them in detail. I wish simply to give a few practical hints on the matter.

Although it requires quite an amount of capital to buy farm implements, there is one great saving connected with their use. One man and team can do as much work and do it better, than two men and teams could without them, and, as the extra man and team must be boarded, this goes far to compensate for the cost of the machinery.

In buying farm implements we must keep in mind several qualifications: such as strength, durability, adaptation to our farms and the work we wish to accomplish. Good implements will be found cheapest in the long run and although the reader has noticed that I have advised economy, and held up debt as a monster evil to be shunned, I believe that it would be wise to borrow money if necessary and buy good

new implements rather than farm with poor second-hand.

Be sure you need an implement before you buy it. There are farmers who allow oily tongued agents to cajole them into purchasing every new thing that comes along, until they have on hand machinery for which they have no use and which is a disadvantage to them.

There is a fine field for co-operation in the ownership or use of agricultural machinery. Many implements will answer for two neighboring farmers as well as for one, and by a mutual agreement they may effect quite a saving. In most cases it would be better that each should own a part of the implements, and exchange rather than to have a joint ownership in each implement. For example: if one buys a reaper, the other can buy a wheat drill, horse rake, and corn-planter which will cost a like sum. One can buy the roller, and the other a disc or some other one of the improved harrows.

Any one of these implements is sufficient for two farmers if they have less than one hundred and fifty acres of land each, and with a fair understanding and agreement, there need not be any trouble in their co-operative use.

A practical point in which many farmers fail is the care of tools. If expensive implements are left exposed to the weather the loss and deterioration from this cause will be much greater than from use. There should be a place for them, and they stored in it when out of use. It is better usually to build a shed for this purpose, than to to keep them in the barn, but whatever place is assigned them see that they are kept there. I would recommend painting with crude petroleum all the wood of farm implements, it costs but a trifle, and wood work thoroughly saturated with it will be uninjured by exposure to the weather, and as all our implements must

be exposed to some extent this painting will be found profitable.

One piece of machinery I think many farmers might profitably own, is a small thrashing machine. There are now made excellent two-horse thrashers, the cost of which is comparatively small, and with which a farmer can—with the regular help of the farm, and in the bad weather of winter, thrash his own grain. He can thus save the worry, haste and hard work of "thrashing day" —and remove one of the greatest terrors of woman's work upon the farm—feeding an army of thrashermen. When a farm is too small to justify the purchase of a machine, a suitable arrangement could often be made and two or three farmers hold one in partnership.

The light of the present time shows that co-operation or mutual help, is to be one of the great means for increasing the profits of the farm, and relieving the burdens connected with farm life.

It might seem almost unnecessary work to call the attention of farmers to the importance of having implements and machinery in condition to do their best work, but unfortunately the number of farmers who may be daily seen wasting their strength and the strength of their teams and work hands with machines that work hard for lack of a little oil or adjustment, or with tools that need the grindstone, shows the necessity of considering the matter.

Solomon said: "If the iron be blunt, and he do not whet the edge, then must he put to more strength," but some farmers—principally of the class, I suppose, who expect to make their way through the world by muscular strength rather than by the exercise of thought, seem to prefer "putting to more strength" rather than put the tool or machine in order.

No labor pays a larger profit than that expended in putting machinery in order and getting tools sharp. A good grindstone well hung, and set in some place where it will be protected from the weather and can be readily used should be regarded as indispensable on the farm. Axes, hoes, mower knives, scythes, and all cutting tools should be kept with keen edges. No man can earn his wages working with a dull tool. Plows should be sharpened whenever they require it, and the time so spent will be time saved. One suggestion here: On farms where it is not thought worth while to keep more than one breaking plow, it will be well to buy the second before the first is entirely worn out.—Then in pressing seasons the old plow can be called into service while the other is being sent to the shop to be sharpened.

Mowers, reapers, drills, wagons, fanning mills, cutting boxes, buggies, and even the wheel barrow, one of the most necessary and useful implements on the farm, should never be allowed to suffer from lack of oil. Not only is machine grease cheaper than "elbow grease" but a machine will wear more in a day's work when needing oil, than in a week if properly lubricated. Use the best oil;—for most machinery and for buggy and wagon spindles, castor oil is the cheapest and best. Do not buy this of your druggist at 50 cents a pint, a second grade can be purchased wholesale at from 50 to 80 cents a gallon which is as good as the best for a lubricant.

An occasional going over a machine with a wrench, tightening all nuts that have become loose, will add greatly to its longevity. Whenever a piece of machinery begins to rattle, destructive wear is going on with great rapidity. As a rule, the more silently any piece of machinery works the better work it is doing.*

*This rule is applicable to men as to machinery. R. S. T.

When a nut shows a disposition to constantly come loose, a leather washer should be placed under it, and the nut screwed tight home on that, and as a final resort, for a badly fitting nut, or in an emergency, a piece of twine may be wrapped several times around the bolt beyond the nut and tightly tied.

Implements when about to be put away for the season should be carefully cleaned and overhauled. Don't stand them away with all the dirt of service on them. It is also a good plan *before* you need any particular implement to go and examine it and see it is all ready. This may save you serious delay and loss in the working season.

Implements used in the soil, such as plows, hoes, spades, etc., should never be left standing, even for a night, with the soil adhering to them. It rapidly causes them to become rough and rusty—making them difficult to work with or to clean.

The man who would have success in farming, should take as much pride in the condition of his implements as in the condition of his stock.

CHAPTER X.

WHEAT.

In large areas of our country wheat is the most important crop to the farmer. It is easily stored, with but little risk of damage if he wish to hold it for an advance, and is always in demand and brings the cash in market. It is not as bulky as corn, and as its average price is more than twice as much per bushel, a team will draw to market about four times as many dollars' worth of wheat as of corn in a given time.

Wheat can be grown successfully on rolling lands which would soon be ruined by washing if kept in corn, and we can grow a clover crop with it to enrich the land. All these considerations make wheat a popular and important crop to the farmer.

Probably there is no crop which gives as good returns for manure and thorough preparation of the soil as this. There has been great improvement in the preparation of seed bed among the farmers of Ohio during the past few years, and it has resulted in a large increase in the yield per acre. I have examined the statistics of Ohio, as it is one of the best winter wheat States, and I see that for eight years, beginning with 1858, there was a succession of poor crops and a great falling off in the yield per acre. Then for five years there was a large gain, there being a series of favorable years. From 1872 to 1876 we had a series of unfavorable seasons, the crop of 1876 in Ohio aggregating, in round numbers, but 15,000,000 bushels,

with an average of 10 bushels per acre. In 1877, we grew 27,000,000, with an average per acre of nearly 16 bushels. 1879 gave us 35,000,000, with an average per acre of 16 bushels. I have referred to these statistics simply to illustrate one fact, which is this: A series of good years leads to the sowing of a large acreage of wheat, and much is badly put in and on poor land; and when an unfavorable year comes, the average yield per acre is cut down largely by the crops on these poor, badly prepared fields. On the other hand, a series of poor crops not only causes a falling off in acreage, but leads to a more careful preparation of the soil. There is no crop grown on the farm that pays so well for extra work as this, and it is encouraging to know there are farmers who grow paying crops through bad as well as good years.

How can we insure uniform and profitable wheat crops? There are several points to be attended to, one of the most important of which is drainage. If the land can be thoroughly under-drained it will be best; but where this cannot be done, we must accomplish what we can by surface drainage. By plowing properly and opening furrows in the right direction, heavy crops may be grown on land which would not give a crop worth harvesting where this was neglected. Lay it down as a rule, that a profitable wheat crop cannot be grown on land where the water will stand. Dr. Townshend, in a lecture before the Ohio State Board of Agriculture, in 1879, said:

"I have often harvested over thirty bushels of wheat to the acre on nearly flat clay soils by rounding the lands and opening the furrows. If any one objects to these furrows as a nuisance, I will answer that the greatest of all nuisances is a poor crop."

He further states:

"I one year underdrained a part of a field at a cost of $22.50 per acre, and at harvest it yielded twenty bushels more per acre than the undrained part of the field, and as the crop

brought $1.25 per bushel, the extra yield paid all the expense of draining, and left me a little in pocket."

The next point in growing uniform and profitable wheat crops is

PREPARATION OF SEED-BED,

And there is no more important point connected with the crop. The maxim, "Tillage is manure," holds good here if anywhere. The best seed-bed for wheat is one that is compact below and fine and mellow at the surface; and to get this, it is essential that we plow early, and cultivate frequently. I believe it would often be economy to pay five dollars an acre to have a wheat field plowed in July, rather than to have it done for nothing the middle of September. The farmer who has land to break should so arrange his work that everything else could wait if the land is fit to plow early. After a heavy rain in July or August, it is quite often the case that there will follow a cool, cloudy spell of weather, when everything is favorable for plowing. The land being moist and the weather cool, a team can plow twelve, or even fourteen, hours a day easier than they can ten a few days later, when the weather has become hot and the land dry. The wise farmer will improve such an opportunity to the utmost.

Another important thing in preparing the seed-bed is to roll as soon as plowed, and I would always advise this unless the season was very wet and we were likely to have heavy rains to settle the land. If a good roller follow the plow each half day, the land can be pulverized and packed down as long as there is moisture enough to plow. If it is allowed to dry after plowing and before rolling, it is often weeks before there is rain enough so that it can be put in good condition; but if rolled at once, a light rain will make it fit for seeding. The farmer rarely, if ever, errs by putting too much

work on his wheat land; and as with most of the implements we use, we can go over a large surface in a day, it is not expensive. I have gone over a wheat field with harrow, roller and plank drag as many as seven times between plowing and seeding time, and been well paid for my labor. I have seen instances where a field was partly plowed and pulverized in July, and then on account of dry weather the remainder left until September, and the difference in favor of the early plowed and pulverized part was more than ten bushels per acre.

When the season is such—as is sometimes the case—that you must plow late and sow immediately, I would always recommend shallow plowing, for the land will not have time to settle so as to make a solid seed-bed, and you will not be as likely to pulverize eight inches well as you will four. There are two reasons why wheat does not do well on a deep, loose seed-bed: One, that it is likely to be covered too deeply, and the other, that it is more likely to freeze out, partly because the loose earth holds more water, and partly because the roots have not a firm hold in the loose soil.

Where wheat follows corn, I would not, under any circumstances, break the land up, because the plowing under of the corn butts would prevent getting the land packed sufficiently. I have seen many failures of the wheat crop from this cause. If obliged to plow late, by all means remove the clover or weeds from the land before plowing. A heavy growth of either may be plowed under in July, for if you manage the land well they will decay and allow it to settle; but this will not be the case if not plowed until September, and they will greatly damage, and often ruin, the crop. In my judgment, it would and be better to be a week later in getting the wheat sown have the weeds or clover removed, than to plow them under.

I have never found an implement which gave better satisfaction in preparing the land for wheat than the disc harrow. This consists of a number of steel rolling cutters, dished a little, so as to turn a small furrow, and set at an angle in the frame. They cut and pulverize the surface completely; and unless it is very cloddy, if this harrow is passed over the field both ways and followed by the plank drag, it will give a perfect seed-bed. In very cloddy fields the roller should be used once or twice in addition. I do not like the old-fashioned tooth harrow for stirring the surface. The double corn plow, with small shovels, does this well, but the disc harrow does it better and more rapidly.

DEPTH OF PLANTING.

Some very careful experiments have been made at the Agricultural College at Lansing, Michigan, concerning the best depth for planting, the result of which I give in the table below. The first column shows the depth the seed was sown; second column the number of days before it came up; third column the proportion of seed that grew:

Depth.	Days.	Grew.
½ inch	11 days	⅞
1 inch	12 "	all
2 inches	18 "	⅞
3 inches	20 "	¾
4 inches	21 "	½
5 inches	22 "	⅜
6 inches	23 "	⅛

A plant from a seed sown too deep, and which comes up slowly, lacks the vigor and vitality of one planted at the proper depth. The best farmers of the present day recommend a depth of about an inch and a half.

VARIETIES.

Something ought to be said about varieties in this article, and yet I know that I cannot recommend any par-

ticular variety that would suit all. Varieties often run out and become unprofitable, and the introduction of a new variety often increases the yield five, and sometimes ten, bushels to the acre. The introduction of the Fultz Wheat to Southern Ohio was worth an incalculable sum to our farmers, as it largely increased the yield. It has proved the most profitable wheat grown for the last six years, and is still holding its place. This matter of variety is of so much importance that I would recommend all large wheat-growers to experiment with one or two new varieties each year, if they can hear of those which promise well; but I would confine the experiment to a single acre. If it does well, it gives you enough seed for the coming year for quite a breadth, and if poorly, it is surely enough. I never discard a tried variety for a new one until the latter has been well tested. A single bushel of wheat, with expressage from a distance, is often expensive; but if you get a really good variety that your neighbors will want for seed, it will pay you largely.

EARLY AND LATE SEEDING.

I have referred to the time of seeding when speaking of the preparation of ground. Some of the most successful wheat-growers of my acquaintance sow the last week in August and the first of September, and aside from the fact that there is more danger from the Hessian fly to this early sowing, it is to be commended. The fly, however, rarely injures wheat that is strong and vigorous. I should always, if possible, have my land in condition to sow by the first of September, and be governed by the weather whether to sow at that time or wait a little. In looking over the record in my diary of my wheat crops for the last seven years, I find my best crop was sown the first week in September. But while in general I would advise early planting, I would not com-

mend it at the expense of a well prepared seed-bed. Plant early if you can plant early and well; but plant late well, rather than early and badly. My heaviest crop of wheat in 1880—over thirty bushels to the acre—was on a field sown October 8th; and a neighbor of mine, a few years ago, harvested thirty-eight bushels per acre from a field sown after the middle of October. I do not quote these instances to encourage late seeding but to show that when, for any reason, early sowing is impossible, very good returns may be obtained by observing the rules for such cases in the preceding sections, namely: Remove, by burning or raking, weeds and clover before plowing; plow shallow and pulverize thoroughly.

I have for some years sown one bushel or less of seed to the acre, and feel quite sure that with the Fultz variety from three pecks to one bushel will produce all the land can support. When we remember that an average head of wheat contains from thirty to forty grains, and that every grain that grows must produce one head if anything, and may produce several, it is evident that when we sow a bushel and a half and reap but fifteen, that two-thirds of our seed has been wasted, for even at the smallest number of grains in a head, and but one head to a plant, the yield would be thirty fold. I speak further on this topic under the head of Experiments with Wheat.

WHEAT ON CORN LAND.

In all localities where corn is a leading crop, and where, as in Southern Ohio, oats are rarely profitable, it is usually necessary, in order to bring about a proper rotation, to sow wheat on corn land. There are many who consider this a slovenly method of farming, and I confess that, as often practiced, it is both slovenly and unprofitable. I know, however, from long experience

and from observing others, that as good wheat *can* be grown on corn land as on stubble, and the expense of preparing the seed-bed will be ordinarily less. Two things are necessary if you expect to grow a good crop: You must keep your corn land free from weeds, and you *must* cut up the corn. If these two rules are observed, you can prepare an excellent seed-bed at a little expense.

I do not wish to be understood as saying that a good crop of wheat can never be grown on a corn field that has been allowed to become weedy and grassy, or when sown in standing corn, for occasionally there may be, but more often it will fail. What I do mean to say is, that a clean corn field, with the corn cut off, gives as good a chance for a wheat crop as any seed-bed we can make. Some years since, Mr. L. N. Bonham, agricultural editor of the *Cincinnati Commercial*, sowed a field of bottom land in wheat. On a part of it the corn was cut up, and the remainder was drilled in among the standing corn. The result was, fourteen bushels to the acre on that sown in the corn, and twenty-nine bushels to the acre where the corn was cut up. The quality of the land was the same, and in both cases it was well put in.

As I have already said, I would not, under any circumstances, break corn land. If the corn is tall and heavy, I cut high, and then cut the butts at the ground; but if the corn is light or short, it may be cut close enough to the ground so that the butts will not interfere with the drilling. If the butts are long, it will pay to take them off, for they will interfere with drilling, and also be in the way if you wish to glean the stubble. The sulky rake will gather up the larger part of them, and the remainder can be picked up by hand. After the corn is off, I would advise that the land be worked both ways. If you have a harrow that will do the job well, such as

the disc or spring-tooth, you can get over ten acres a day, and they will, if followed by roller or plank drag, put the land in the best possible condition. The next best implement is the double corn plow with small shovels, and with this you can get over six or eight acres a day. It may be gone over once with this, and then cross-harrowed with a common harrow; but I would always use the roller or drag before drilling. It is advisable to plant an early variety of corn where you are intending to seed to wheat.

To show what success I have had growing wheat on corn land, I will make a few extracts from my diary:

"Sept. 22, 1877. Sowed six acres of wheat where corn had been cut up." This field averaged twenty-six bushels per acre.

"Sept. 19, 1878. Sowed four acres of wheat on corn land at home, and six acres on north farm." The first made an average of thirty bushels per acre, and the last twenty-two.

"Oct. 8, 1879. Sowed four acres of wheat where corn was cut up. The corn was very light, as the land is cold and thin. Manured each acre differently." This wheat was not threshed separately, but there were one hundred and seventy-eight shocks, large bind. My entire crop of seven hundred shocks, threshed four hundred and seventy-two bushels, and this would show an average of thirty bushels per acre for these four acres.

"Sept. 24, 1880. Sowed twelve acres of wheat on corn land on home farm." This wheat averaged fifteen bushels to the acre, but it will be remembered the crop cut in 1881 was a very light one generally, and this wheat was very much better than ten acres grown on wheat stubble. We have sown this fall — 1881 — twelve acres of wheat on corn land, which is looking as well as I could wish. It was sown September 17th.

I have given these extracts from my diary, to show the dates at which I have been able to sow for several years, and the success I have had. The average for the four years is over twenty-two bushels per acre; and leaving out the last year, which was an exceptionally bad one, the average is over twenty-six bushels.

The principal objection urged against seeding on corn land is the trouble and expense of cutting up the corn, but as I shall speak of that in the chapter on corn, I will pass it for the present.

THE COST OF WHEAT-GROWING

Is an interesting question, and as it is but little trouble, I advise every farmer to keep a debit and credit account with each wheat field. By so doing, he will soon learn that the cost per bushel decreases as the yield per acre increases, and I believe that many farmers would thus be led to grow fewer acres and more bushels.

In keeping an account with my wheat crops, I put down the rent of land at eight per cent on the valuation of the particular field, and allow nothing for taxes, as I consider the rent includes this; I do not include hauling and threshing, for I believe the straw to be worth enough to cover this. When I use manure on the field, I charge the wheat crop with fifty cents per load, for although it is worth more, and often costs over $1, a part of this should be charged to succeeding crops. When I use commercial manures, I charge the actual cost to the wheat crop. I charge $1 per day for each man and horse. For harvesting I charge the usual price per acre for the machine, and actual cost, including board, for help employed. I have each field on my farm valued, so as to know at once what rent to charge it. I shall explain this more fully in the chapter on Farm Accounts. I began keeping an account with my wheat crops in 1877,

and have a detailed account with each crop grown since, so that I can at a glance tell the cost, profit or loss on the crop.

To show what it has cost me to grow wheat, I will copy from my book the account with some of my crops. I will begin with a six-acre field, two acres of which was wheat stubble and the rest corn land:

ACCOUNT WITH SIX-ACRE WHEAT FIELD.

"July, 1877. Breaking two acres	$3 00
Working four acres twice with double corn plow	4 00
Harrowing and rolling	6 00
Cutting and picking off corn butts	5 00
4½ bushels of seed at $1	4 50
Drilling	2 40
June 24, 1878. Harvesting	9 60
Board of harvest hands	2 50
Rent of land	36 00
Total,	$73 00

The crop on this field was one hundred and eighty bushels, and sold for 95 cents per bushel, making $171. Deducting cost of growing, leaves $98, net profit. This makes $16.33½ net profit per acre, and shows the cost of growing per acre, including rent, to be $12.16⅔. The profit, after allowing 8 per cent on a valuation of $75 per acre, was nearly 22 per cent. The cost per bushel was 40½ cents.

In 1878, I sowed eleven acres of wheat on my north farm. This was on the fifty acres of thin land referred to in a former chapter. This land cost me but $20 per acre, but as this field was the best part of it, I have valued it at $30 per acre. My account stands as follows:

"July 31, 1878. Preparing seed-bed	$22 00
Sept. 25. Seed wheat, 10 bushels,	9 50
Carried forward	$31 50

Amount brought over	$31 50
Drilling	4 00
Fifty loads of manure at 50 cents	25 00
One barrel bone meal	6 00
June 23, 1879, Cutting, at 60 cents per acre	6 60
Five hands at $1.50 per day	7 50
Board of help	3 00
Rent of land at 8 per cent on valuation of $30	26 40
Total	$110 00

The field produced 241 bushels, which was sold from the machine for 95 cents, making $228.95. Deducting cost, leaves $118.95 as profit. Cost per bushel a fraction over 45 cents. Profit on value of land, a fraction over 36 per cent.

Ten acres of the same field was sown in wheat in 1879, and the account as copied from my book, stands thus:

"July, 1879.	Breaking	$15 00
	Rolling	3 00
August 4.	Thirty-eight loads manure	19 00
" 21.	Stirring with corn plow	4 00
" 24.	Harrowing and rolling	6 00
Sept. 8.	Nine bushels seed wheat	9 00
"	Eight hundred lbs ground bone	12 00
"	Drilling	4 00
"	Rent of land	24 00
June 16, 1880,	Cutting at 60 cents per acre	6 00
"	Four hands, at $2 per day	8 00
"	Board of hands	2 50
Total,		$112 50

The crop made an average of fifteen bushels per acre, and sold for $1.05 per bushel from the machine, making $157.50. Deducting cost leaves a profit of $45; cost of wheat per bushel 75 cents; profit on land 15 per cent.

Lest some one should criticise these figures where they notice that in 1878 there is but $22.00 charged for

preparing seed-bed on eleven acres, and $28.00 the following year for ten acres of the same land, I wish to give a word of explanation. In the first named year the field was about half in corn and the balance in sorgo, beans, oats, and potatoes, and required less labor than if it had needed to be broken up. The next year I allowed $1.50 per acre for breaking, which many will object to as being too little. In reply I answer that we had a fine rain followed by cool, cloudy weather which enabled us to plow two acres a day. I have in all these accounts charged actual cost where it could be ascertained, and allowed one dollar a day for each man or three dollars a day for a man and team. When our regular farm hands or myself helped at harvesting, I have charged harvest wages, and I have charged twenty-five cents per meal for each man boarded in harvest.

VALUE OF STRAW TO THE FARMER.

The reader will notice that in all my estimates of the cost of wheat growing, I have stopped when the wheat was in the shock. This is because I believe the straw to be worth to the farmer who knows how to properly manage it enough to pay for hauling and thrashing the crop.

The proportion of wheat to straw will vary with different seasons and varieties of wheat, but as a general rule we shall have about two pounds of straw to one of grain. This would give six tons of straw for one hundred bushels of wheat. As the machines charge from four to five cents per bushel for thrashing, I think it a fair estimate to call the entire expense ten cents a bushel; I think the hauling to the machine could be done for less than $3, but we will call it that, which would make our six tons of straw cost $13. I am willing to call it $2.50 a ton, and this would allow $2 on each hundred bushels for taking the wheat to market, and with the railroad facilities we

now have this will often cover the cost. It would seem unnecessary to enter into an argument to prove that straw is worth $2.50 per ton to the farmer. Whether we look at it from the scientific standpoint comparing its chemical analysis with that of hay and fodder, or from the practical side, it is certainly worth much more than this.

I have no hesitation in saying that if farmers took as good care of their wheat straw as they do of their hay, that it is worth for stock, half as much. I will make the further statement, that fifteen hundred pounds of bright wheat straw fed in connection with 250 pounds of wheat bran and 250 pounds of corn meal mixed, will be worth, for horses or cattle, as much or more than one ton of the best hay. Even when straw is stacked in the barn-yard and the cattle allowed to run to it and help themselves, it is worth for food, shelter, and manure more than $2.50 per ton.

Straw is worth for manure much more than a chemical analysis shows, for it is to most farmers the cheapest and most convenient absorbent they can use, and without it on many farms most of the liquid and soluble parts of the animal manure would be lost.

EXPERIMENTS WITH WHEAT.

During the last few years I have tried some experiments with wheat, which while not conclusive in their results, have been of great interest.

In 1877 I sowed two adjoining acres with wheat, using one half bushel of seed on one acre, and one bushel on the other. The land was strong and in good condition, and although the wheat where the half bushel was sown looked quite thin at first, before winter set in it had stooled so that little if any difference could be seen. At harvest I had a neighbor to cut it for me, and I told him

and the binders how the wheat was sown, but did not tell them which acre had the light seeding, and not one of them could tell. I shocked the grain, and found fifty-two shocks on one acre and fifty-one on the other. The two acres thrashed seventy bushels. The next year I sowed six acres using three pecks of seed to the acre, and harvested 180 bushels, an average of 30 bushels to the acre.

My first experiment with bone meal was in 1878, when I used a single barrel, and as I could not get a fertilizer drill I sowed it broadcast. On either side of it I used stable manure, and through the center left a strip twelve feet wide unmanured. The land was heavy clay and badly worn. The stable manure gave the wheat a good start in the fall so that it covered the ground quite well, but up to the time winter set in I saw no benefit whatever from the bone meal. As soon as spring opened the wheat where the bone was sown grew luxuriantly and showed a dark green, and the strip left without any fertilizers was so poor that it was easy to trace it when standing eighty rods away. At harvest the wheat where the bone was used was nearly as good as where heavily manured with stable manure, and was a foot taller than on the unfertilized strip. I did not cut and thrash separately, but estimated that every dollar's worth of bone gave from two to three dollar's worth of wheat, besides improving the quality. This experiment not only showed that I could use bone meal profitably but that it was best to use with it some quicker-acting manure to give the wheat a start in the fall.

Superphosphate is quicker in its action, and when the farmer depends on commercial manures I think it would be wise to use half of this and half ground bone, or if he has a ten acre field on which he intends to use fifty loads

of manure and a half ton of bone meal, it would be wise to scatter the manure over the entire field and put one hundred pounds of bone on an acre, than to put two hundred pounds of the latter on five acres and the manure on the other five.

In the fall of 1879 I sowed four acres of wheat the 8th of October on a piece of land where we had cut off a very light crop of corn. We had plowed the corn late and then gone through with hoes, so that the land was perfectly clean, and we had no difficulty in making an excellent seed-bed. I divided the piece into four equal strips, and on No. 1, I drilled one barrel of sifted hen manure. On No. 2, I put twelve loads of good rotten stable manure. On No. 3, I drilled two hundred pounds of bone meal, and on No. 4, I drilled two hundred pounds of ammoniated flour of bone, which is quicker in its action than the ground bone. I left strips ten or twelve feet wide without fertilizer of any kind between these plots. They were not cut separately, but I examined them very carefully comparing one with another and with the unmanured strips, and reached these conclusions: That the entire crop was doubled by the fertilizers. That the stable manure gave a little the heaviest crop. That there was no perceptible difference in the plots where the hen manure and bone meal were used, A comparison with the unmanured strips left no doubt that the stable manure gave more than an extra bushel of wheat for every load used, and that the other fertilizers gave three to five bushels of increase for each dollar's worth used.

I can give no better advice to wheat growers than that they try some experiments each year. I would suggest that those of which I have spoken be repeated. If you have not a fertilizer drill the commercial manure

can be applied by hand. Learn what bone meal, night-soil, hen manure, etc., are worth to you on your own soil. Always leave an unmanured plot adjoining with which to compare, and if possible cut separately and weigh the product of each. Try also, extra pulverization. After you have your field in what you call good condition, put an extra dollar's worth of work on one acre of it, and see if it does not pay. Try burning straw on a plot in your field, and see what effect it will have on the soil. Plow a plot four inches deep and another eight, and give them the same treatment after, and note the difference, if any. Plow under the manure on one plot, and top-dress the adjoining one. Harrow thoroughly a strip of wheat through the field in the spring. If you are afraid of injuring it you need only try a rod wide, but go over it till the surface is thoroughly mellowed, doing it, of course, when the land is dry enough to pulverize. All these experiments are interesting and valuable. There are many questions which cannot be answered for you by another, but a little care in experimenting will enable you to answer them for yourself for all time.*

*Mr. Brown is fond of experimenting, and these suggestions —like all he makes, are good. But the farmer should bear in mind that experiments are valuable only for results, and unless a careful record of experiments is kept they will be valueless. I would recommend the progressive farmer to keep a separate book for experiments rather than to enter them in his diary where they are liable to be lost sight of among other matter. Do not crowd the book. Head a page with the name of the experiment, and then fill in the details as they occur. Make your experiments as conclusive as possible. One experiment carried through to a conclusion, is worth a dozen half completed. Many experimenters spend their labor for naught, from lack of care in particulars. As far as possible, measure and weigh results, and record the measurements. An experiment in which you guess at the amount of land and at the quantity of seed and at the results, may be very interesting to you, but no fact of value was ever so determined. The experimental farmer must cultivate business care and accuracy. R. S. T.

CHAPTER XI.

CORN.

The statistics of Ohio from 1850 to 1880 inclusive, show that the amount of corn ground in the State in 1850 was one and a half million acres.

There has been a steady increase in the acreage, until several times in the last few years it has exceeded three million acres.

The smallest yield during this time was 1858—fifty million bushels. In 1872, for the first time, the crop reached one hundred million bushels, and since that time it has but three times fallen below that amount, while in 1878 it reached the highest, one hundred and fourteen million bushels.

In all this time the average yield per acre for the State has but once exceeded 40 bushels, and the average for the whole time is a little less than 34 bushels to the acre.

As Ohio is a good corn State, and though not producing quite as large quantities as some of the Western states, yet yields as much to the acre, we can well take these figures as the ordinary results obtained by farmers throughout the Union.

So much for the actual yield, now let us take a look at the possible yield.

In 1877, while editing the agricultural department of the Weekly *Enquirer*, I offered a number of premiums for the largest yields of corn on one acre.

Nineteen sent in reports, the land having been

measured and the product weighed by disinterested parties. For convenience I arrange these reports in tabular form:

	LOCATION.	BUSHELS ON THE ACRE.
No.	1, McLean county, Illinois,	118
"	2, Tipton county, Indiana,	110
"	3, Pickaway county, Ohio,	110
"	4, Clinton county, "	106
"	5, Montgomery county,"	105
"	6, Sandusky county, "	104
"	7, Wayne county, Indiana,	104
"	8, Madison county, "	103
"	9, Delaware county, "	102
"	10, McLean county, Illinois,	101
"	11, Belmont county, Ohio,	100
"	12, Blackford county, Indiana,	98
"	13, Scott " "	91
"	14, Shelby " "	91
"	15, Decatur " "	88
"	16, Shelby " "	88
"	17, Coles county, Illinois,	82
"	18, Stark county, Ohio,	78
"	19, Fairfield county, "	68

The average yield per acre of these nineteen trials was ninety-seven and four-nineteenths bushels.

WHERE THE PROFIT COMES IN.

The actual cost of labor in growing an acre of corn cannot well be reduced below $6.50. Add to this $5.00 per acre for interest on investment and taxes, makes $11.50, and taking the Ohio average for the past thirty years of 34 bushels per acre, would make the corn cost 31 cents a bushel to those who grew average crops. A high cost, considering the usual market price, and one that leaves but little profit to those who grow but average crops.

It necessarily follows that those who grow less than average crops lose money at the business.

The parties who grew the above premium crops reported the costs of doing so, which averaged, for labor alone, $8.90 per acre. Adding as before $5.00 per acre for taxes and interest on investment will leave the cost of their crops $13.90 per acre, which divided by the average yield gives a cost of about 14½ cents a bushel.

The conclusion is obvious:—The profit in corn growing comes in the big crops, and that if by increasing the cost for labor one-half, we can double the yield, we have made a very profitable investment.

In nearly every case the growers of these premium crops report an extra amount of labor in getting the soil ready. A number reported $1 per acre expended in harrowing, rolling or dragging—an amount sufficient to bring it to a very fine condition of tilth.

Nearly all of these crops were grown on sod land, and without manure.

SAVING SEED CORN.

The first necessity for a good corn crop is good seed. The loss sustained by our farmers from lack in this matter is enormous, while the cost of selecting and caring for corn that could be depended on for certain germination is but a mere trifle. While it is true that perhaps three years out of four the farmer can go to his crib and pick out corn that will grow; yet it is also true that sometimes it will not, and heavy loss is the consequence.

Seed corn should be carefully selected in early autumn, and placed where it will be thoroughly dried before hard frost Freezing does not injure well matured and well dried corn, but corn that is immature, or is caught by frost before it is entirely dry is liable to have the germ destroyed.

It should be stored in a dry, airy place. Many farm-

ers follow the plan of stripping the husk back and hanging the corn up in an airy loft.

Another plan highly recommended is to hang the corn in the smoke-house and allow it to be thoroughly smoked with the meat. Not only is this a good and sure way of keeping it, but it is said the grain becomes so thoroughly impregnated with the smoke that insects will trouble neither the grain nor the young plant.

But there is more in this matter of selecting seed corn than merely to get that which will grow. I like Dr. Sturdevant's idea of "pedigree seed corn" and have no doubt that by a careful and persistent selection of seed, the yield may be very materially increased. All careful experiments in this matter of "breeding" corn show that much can be done. I established a new and valuable variety of sweet corn from a "sport," but it took five years of careful selection to do it.

PLANTING AND CULTIVATION.

The improvements in methods of cultivation in corn have kept pace with other matters of farm management. I remember, when a boy, that the land was marked off and the crop tended with a single shovel plow. It was dropped by hand and covered with a hoe, and no pains were taken to keep the field clear of weeds during the latter part of the season. On the rich, Whitewater bottoms, where my boyhood was spent, the field would become a wilderness of spanish needles and cockleburs, and the first work I can remember was riding the horse that dragged a brush between the rows in order to rattle off the needles and burs so that they might not impede the huskers, and the weeds were often so tall, that sitting on the horse I would be covered with the needles.

The farmer in this latitude should if possible finish breaking his land in April, which will give him abund-

ant time to get it in good order before planting. Judgment must be exercised in preparing the land. If the spring is dry there is no danger of too much pulverization, but in a wet spring it will be better to leave the general surface of the field rather rough, and draw a log along the furrow to pulverize enough soil to give the corn a start. The remainder of the field can then be made fine and level before the corn comes up, so that at the first working you can get close to it without covering it.

Time of Planting.—I like reasonably early planting, and am certain that in most cases it gives better results, but there is no use in planting until the weather and ground gets warm, no matter what the time of year may be. Corn will not grow when the ground is still cold from the winter frosts, and seed planted before there is sufficient warmth to cause it to germinate will rot in the ground, and the farmer will often blame the seed when he should have blamed his lack of knowledge of the simple principle that a certain amount of warmth is necessary to cause the corn to germinate.

Hill or Drill.—This has been a question on which much time has been spent. Both methods have their ardent advocates. I think it is pretty well established that where the land is clean, and the farmer has the right kind of implements for thorough cultivation, and knows how to use them, more can be grown on the acre in drills than in hills, but as it is much more difficult to keep drilled corn clean, I would always advise that where the land is foul, or where the cultivation has to be mainly left to hired help, the hill plan should be adopted.

Depth of Planting.—There is an interesting scientific fact connected with this—the decaying grain must furnish all the food to the young plant until the leaves

reach the surface and expand in the light and air. Consequently if too deeply buried, the nutriment in the grain is exhausted before the young plant is able to draw food from the soil, and it becomes enfeebled. Careful experiment shows that with the land in good order one and one-half inch is about the best depth for covering corn.

CULTURE.—If the spring is backward, the nights cold, and the corn inclined to be unthrifty, take the bar plow and run it as close to the row as you can, using a fender or rolling cutter on your plow, and turn the soil *from* the row, running the plow about five inches deep. If your corn is planted as straight as it ought to be this ridge on which the corn is left standing need not be more than five inches wide, and the sun soon warms this and starts the corn into a vigorous growth. I have had frequent opportunity to compare adjoining rows, one plowed as I recommend, and the other worked from the start with a cultivator, and the difference in favor of the barshare plow was very perceptible. In warm, pleasant springs of course working with the cultivator from the start does equally well.

Within a few years the double barshare plow has been introduced and gives good satisfaction. It consists of two light bar plows with one handle each, attached to each other by an adjustable wooden bar front and rear. For small corn a rolling cutter is used on each plow, so as to entirely protect the young corn, and in drilled corn where the rows are straight it can be set so that not over three inches of earth is left unstirred; and with well planted hill corn the work can be done almost as effectually.

It is often a question how much and how long corn should be cultivated. I am confident that increased

cultivation gives an increased yield, and as an extra bushel per acre will about pay for an extra plowing, I think it will pay to cultivate oftener and longer than is usually done. An opinion has been prevalent that plowing corn after the tassel has begun to show is injurious. It undoubtedly is if the corn has been neglected till the ground has become compact and set with weeds; but the experience of our best farmers has shown that if the cultivation is continuous it may be kept up till late in the season, not only without detriment, but with great advantage to the crop. Mr. L. N. Bonham, a corn-grower of great experience and success, says he plows his corn till the pollen chokes him, and finds it pays.

The drought of the past summer (1881) has shown the importance of thorough preparation of the soil and constant cultivation. Wherever corn was planted in lumpy soil, or allowed to become weedy, the crop is well nigh a failure; but on adjoining fields, with no better soil, where pulverization and tillage was thorough, there has been a profitable crop.

When the corn land is to be seeded in wheat, a double advantage is gained by late culture. In fact, it is both difficult and expensive to properly put in a crop of wheat on corn land where the cultivation has been discontinued early in the season, and the ground become filled with weeds.*

*Mr. Brown has omitted mention of one implement which many of our best farmers prize very highly in the cultivation of corn, namely, the harrow. Some of our best corn growers begin their cultivation by harrowing the corn just before it comes up, and then again as soon as it is fairly above ground paying no attention to the rows. Although it looks as though the harrow was destroying all the corn, yet in a few days every plant will show itself again all the better for the struggle. It is getting to be generally conceded that corn cannot be cultivated too early, and that often the most valuable cultivation it receives is the first. R. S. T.

INSECT ENEMIES.

Corn is troubled with these less than most other crops but occasionally cut-worms injure it badly, The smoking of the seed-corn is said to be a preventive of this. It is also said that the application of salt and land plaster mixed in the proportion of one part of the former to two of the latter, and a pinch applied to each hill will entirely stop their ravages. A barrel of the mixture is sufficient for eight acres.

FERTILIZERS FOR CORN.

Clover is the cheapest and best fertilizer for this crop, and the farmer who uses all his manure on the wheat crop and sows clover with the wheat, will grow heavier crops of both wheat and corn than if the manure was used on the corn land. A clover sod gives a clean and mellow seed-bed for corn, and it is easier and pleasanter to draw manure over the solid land in July and August, than over the soft miry earth in March or April.

VALUE OF CORN FODDER.

In the nineteen corn reports referred to in the beginning of this chapter, but one of them allowed anything for the fodder and then only one dollar an acre, and as managed by a large proportion of western farmers they do not realize this amount from it, and often injure the land by tramping when wet more than all they get is worth. The farmers of the New England states put a very high value on corn fodder, often more than would buy a heavy crop of corn at the West. I know that corn fodder in New England is worth more than in the West, for two reasons: Their small varieties of corn make better fodder than our coarser growing kinds and it is much pleasanter to handle, and hay brings a much higher price with them than with us.

I know that corn fodder is so valuable with us that it

is wasteful to leave it in the field, and that a handsome profit above the cost of saving can be made on it.

What is an average acre of corn fodder worth, and what does it cost? I answer to the first question, it is worth as much as a ton of good hay, and this estimate is based on twenty years' experience in the use of fodder, and I have during that time fed hay enough to enable me to compare the two. I have kept from eight to twenty head of horses and cattle each winter, and three-fourths of the time I have not cut a pound of hay a year but depended on corn fodder for work teams, milk cows, and stock cattle. I have been confirmed in this estimate of the value of corn fodder by many farmers of large experience in its use. As to its being palatable to stock and their thriving well on it, I find that it takes the very best hay to equal it. The great objection to it on the part of many farmers is, the amount of waste and the butts in the manure pile. The waste of corn fodder is less than many suppose. Some years since I conducted a series of careful experiments to ascertain what the actual waste was. I was at that time milking seven cows and selling butter to a hotel. For several days I weighed the fodder for the cows and after each feed weighed the waste, and I found that they ate just two-thirds of the fodder. I also found that a ton of the fodder would feed a cow three months. We were feeding in addition ten pounds a day of bran and corn meal mixed equal parts, and on this diet they kept up a full flow of milk, and the same ration fed to dry cows soon made them ready for beef. I know that the part of the fodder the cattle eat is worth as much as the same weight of the best hay, or in other words, three tons of fodder is worth as much as two tons of hay. Now let us estimate the cost. I have hired all my corn cut up for years, and it has cost

me about $1.25 per acre. The price for some years was five cents for shocks containing 100 hills, but of late years I get 144 hills—or shocks 12 hills square—cut for this, and my hands make over $2 a day at this price; some of my neighbors paid but four cents for shocks of this size. As we usually plant, this would give about twenty shocks to the acre. It costs but little more to get the corn husked from the shock than from the standing corn. I have never paid above eight cents a shock and this includes binding the fodder in bundles. We use rye straw for this purpose, and unless we are ready to draw the fodder to the barn or stack the same day, the husker sets the bundles up in shock and ties a band round the top to hold them together. After deducting what it would cost to husk the corn if it was not cut up, less than $3 will cover the entire expense of cutting up and securing in barn or stack an acre of corn fodder if let out by the job, I have spoken of stacking fodder; there is no product of the farm more easily stacked. All that is necessary is to make the stack narrow so as to keep the middle three or four feet higher than the edges, which gives a good slope to the bundles. It will shed the rain and keep perfectly. I prefer to build rather small stacks containing from sixty to one hundred shocks each, or if a larger one is wanted make it long and narrow so that it can be put up and taken down in sections. Whatever else may be neglected, shocked corn should be husked and the fodder hauled before winter sets in. When the ground freezes the fodder freezes down to the ground, and when a thaw comes the fields are so muddy that it is exceedingly disagreeable to handle the fodder, and if the field has been sown to wheat this crop will be seriously damaged. If the corn is left out till spring the injury to grain and fodder

is often more than the cost of husking. The wise farmer will secure help enough to finish up this work during the pleasant weather.

There are two ways of managing the waste: One is to clean out the mangers every day and scatter the contents over the barn-yard. The cattle soon tramp them into the common mass of straw and manure, and they give no trouble. In four weeks after forking up the manure in the spring in a small barn-yard in which I had thrown the butts from twenty acres of heavy corn, it was fine enough to use on the garden. The other and the best way is to cut up the fodder and use the waste for bedding. This may be done by cutting it fine in a cutter of some kind, or if but little stock is kept it can be cut into six-inch lengths on a block with a cleaver, and even cut this length the waste will make good bedding.*

I have found corn fodder the best bedding material for hogs confined in pens during winter. It keeps cleaner and lasts much longer than straw, and the hogs need some bulky food and they will eat the blades and part of the husks.

There is one more point connected with corn, and that is, that when fed entire grain, husk and blade, it furnishes a perfect ration, just the right proportion of flesh and fat formers, and this fact stated by scientific investigators is confirmed from the fact that shock corn fed to cattle keeps them in fine condition, and gives a large gain both in flesh and fat. I shall speak of fodder corn in the chapter on "Special Crops."

*Some persons claim that feeding corn fodder cut up makes the mouths of the cattle sore. R. S. T.

CHAPTER XII.

GRASSES.

VALUE OF THE CROP.

The importance of this crop is often underestimated. Ohio statistics for 1879 show the wheat crop of the State as worth fifty-one million dollars, and the hay crop at only nineteen million; but hay does not represent the entire value of the grass crop, as a large proportion of the grass is pastured and not cut.

The grass crop, also, when properly used, tends rather to renovate than to wear out land, and the wise farmer, in regions where grass is a successful crop, can greatly increase his profits, diminish his labor and expenses, and improve the fertility of his farm, by keeping a considerable portion of his land in grass.

It is true that in some portions of North-eastern Ohio, where the land has been kept in grass from the earliest settlement of the country, and the products carried off in milk and cheese and meat, the land has suffered deterioration as surely as, though more slowly than, under continuous grain cropping; but where grass is made a part of a rotation, it always has a beneficial influence on the land, and where the dairy business is not extensively followed, and the pastures stocked with grown cattle, or especially, sheep, the land may be kept in grass indefinitely without deterioration.

There are many broken farms in the hilly sections of the country, which are cultivated in corn and wheat year

after year, not only at a loss to the farmer, but the total and irremediable destruction of the farm by washing, which, if seeded down in permanent pasture and stocked with sheep, would maintain their fertility, or even show a gain, and bring their owner a steady income. The best illustration of this I have ever seen is on the high bluffs of the Miami river, near its mouth. On one farm you will see the hills clothed in blue-grass from base to summit, taking on a dense green with the first open weather of spring, and often covered with flocks, making a good living on them by the first of April, and again in November and December. On an adjoining farm, which has been cultivated in grain, the hills are seamed and gullied until almost valueless.

In many sections of the country where clover does not succeed well, grass entirely takes its place in a rotation. One great advantage connected with grass as a standard crop, is the light expense and labor. When pastured, the expense of harvesting is naught, and even when cut for hay, the expense is light compared with most other crops.

VARIETIES TO CHOOSE.

In this matter the farmer must be governed by his locality, nature of soil and purpose he has in view. There are certain varieties of grass which flourish on certain geological formations and will not grow on others. Some are excellent for pasture and of but little value for hay; and others again, make the best hay, but do not make good permanent pasture. Some varieties will grow on very wet land that could not otherwise be utilized without underdraining. Others would winter-kill on such land.

For permanent pasture we have three excellent grasses, all of which flourish on a large area of our Western

States. These are blue grass, orchard grass and red top.

BLUE GRASS belongs especially to a limestone country, does best on dry, rolling lands, and yet flourishes on many sections of the Western prairies when once it gets a hold. It forms a close, tough sod, that saves hillsides from washing, and will endure during the open weather of winter or early spring an amount of tramping that would be ruinous to some other varieties. It is sweet and nutritious, making the best of beef and milk, and is relished by stock of all kinds. It starts into vigorous growth with the first open weather of spring, and continues green and fresh late in the fall, and in some sections furnishes good picking all through the winter, when the ground is not covered with snow.

It does not endure heat and drought well, and in a summer like that of 1881, fails entirely, but it comes forth with wonderful vigor and freshness with the first fall rains.

It is slow to take hold of the ground, and should never be sown except for permanent pasture.

For the same reason, in starting a blue grass pasture, the seed should always be sown with some other grass. I prefer to sow with timothy, as this will not shade it too much, and about the time the timothy runs out, the blue grass will be ready to occupy the land.

Be careful to know that you have good, fresh seed, as there is probably no grass seed sold that is more often worthless. Sow late in the fall or early in the winter, using one bushel of seed to the acre, and use as much timothy seed as if you had sown no blue grass, for it will make but little show the first year or two.

Never sow blue grass with red clover, as it will not succeed.

It is said that if the seed is scattered over the hard

surface of an old pasture, it will take root and do as well as on mellow ground. Wherever it does once get a foothold, it will ultimately crowd out everything else.

I have tried the plan of getting a set of blue grass by "grafting," which proved successful. I cut sod one and a half or two inches thick, and cut this into pieces two inches square, and on a field that had just been sown to oats dropped these pieces, about two feet and a half apart each way, and stepped on them to press them into the mellow ground. Every piece grew and the grass is spreading from them rapidly. On a large scale, the pieces might be scattered from a wagon with a shovel or manure fork, and pressed into the ground with a roller.*

Blue grass flourishes well in the shade, and enables us to make profitable wood pastures. Near my farm are several plantations of locust timber, where the trees stand so close it would be difficult to drive between them with a wagon, and yet the land is heavily set in blue grass, and carries nearly as many cattle to the acre as land that is fully exposed to the sun. By a little care, wood lots may be set in this grass and pay a fair interest on capital invested.

Red Top does well on almost all soils, but will thrive on soil so wet as to be unfit for other purposes. Like blue grass, it bears tramping well, and on rich soil will produce a heavy crop of very fair hay, which though not quite equal to timothy hay, can be produced on land not fitted for that crop. For pasture, it is fully as acceptable to stock as the average of grasses.

Red top should be sown on a mellow and level surface,

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*Where for any reason there is difficulty in geting a start of blue grass from the seed, this plan may prove valuable; but in ordinary cases I should imagine that the labor would cost more than the seed. R. S. T.

as it is a delicate seed, and will need no covering, as the rains will wash it in sufficiently. It may be sown at the time wheat is put in, and if sown alone, two bushels of seed is none too much; but as, like blue grass, it is permanent and will spread, it is better to seed with one bushel (fourteen pounds) of red top and six quarts of timothy.

Orchard Grass.—Though coarse, this grass makes good hay and better pasture. Cattle are very fond of it, and chemical analysis shows it to be richer in flesh-producing elements than timothy, and nearly as rich in fat-producers.

It is a good grass to sow in connection with red clover, as it ripens early, prevents the clover from lodging, and makes it easier to cure. It thrives best on a rich, warm soil, and seems specially adapted to creek bottoms.

Orchard grass may be sown in either fall or spring; should be sown on a well prepared surface and covered lightly. The fertilizer attachment to the wheat drill will sow it evenly and well, if not in use for fertilizers. To prevent the forming of stools, heavy seeding is required, and it will pay to apply two and a half bushels to the acre.

In seeding down land to permanent pasture, the best results are obtained from a mixture of blue grass, red top and orchard grass. Stock thus gets a variety of food; and on broken lands, which are the kind that should be chosen for this purpose, there is usually a large variety of soil, and if one kind fails on any particular portion of the field, one of the other varieties will succeed and prevent a barren spot.

There is much pasture land which yields no profit to the owner, and which loses, rather than gains, fertility, on account of too early pasturing in spring and over

stocking. A plant continually kept cropped close to the ground, can develop but little root, and the roots are the source not only of a heavy growth, but also of fertility. Better sow a field of rye for early feed than turn stock on pastures before the grass has fairly started.

TIMOTHY.—For the regular hay crop, no grass has ever been found superior to this. It usually brings a higher price in market than any other. It is not suitable for permanent pasture, as it usually runs out in two or three years; but it makes an excellent part in a rotation, and leaves the land in good order for corn or wheat.

Timothy is usually sown with wheat or oats, and most drills are now provided with grass seeders. I would sow not less than a peck to the acre. This is rather more than is commonly used, but I am satisfied that a heavier stand of grass can be obtained, and as the statistics show that the average hay crop of Ohio is but one and one-sixth tons, it is evident that something needs to be done in the matter.

Bone dust is an excellent fertilizer for grass, and it will be well to use about two hundred pounds to the acre in sowing wheat with timothy. The occasional application of the same amount as a top dressing to meadows, will doubtless be found beneficial in most localities, and it will pay each farmer to determine by experiment what its effect will be on his farm.

MAKING HAY.

The question of the time to cut hay has been debated in granges and farmers' clubs till it has grown monotonous. A few simple principles, however, will settle the generalities of the question, and after that each farmer can determine the details for himself.

Immature plants do not contain as much nutritive matter as those that have nearly arrived at maturity, nor are

they easy to cure. When the seed is allowed to ripen in the plant, a large portion of the nutritive matter in the plant goes into the seed, and the plant itself remains little more than a mass of woody fiber.

The time to cut hay, then, would seem to be just after the blossom has fallen and before the seed has ripened. Some persons cut while in bloom. This makes very dusty hay.

Some claim that a timothy meadow will not run out so soon if not cut until the seed ripens. This is true, but only so because in harvesting a large amount of the seed shatters out, and the ground is practically re-seeded. This is seeding the ground, however, at the expense of the value of the crop of hay.

ANNUAL GRASSES.

Some of these are of considerable importance to the farmer, especially when, from any reason, the meadows are short, as they can be sown late and usually yield heavy crops of hay—not quite equal in value to timothy, but very useful in its place.

Hungarian grass and German millet are the best known. They should not be sown until the ground is quite warm, usually the first of June, though in some sections they can be grown successfully when sown in July. Good crops have been grown on land from which a crop of wheat had just been cut.

Work the ground thoroughly and seed heavily—three or four pecks to the acre—as with thinner seeding the plant will be coarse. Cover with a plank drag, which will press the seed into the earth and insure quick germination, and also leave a smooth surface for the mower to run on.

CHAPTER XIII.

CLOVER.

ITS VALUE ON THE FARM.

In estimating the value of a crop of any kind, many items have to be taken into consideration. These include not only the money value of the crop after it is produced, but the cost of its production and the effect upon the soil. To the cost of seed and labor used in growing a crop of wheat or corn must be added a certain amount to cover fertilizing elements that have been taken from the soil, and which must be replaced if the land is to continue productive.

I estimate the cost of growing and harvesting an acre of corn or wheat at $8. Of course this will vary with varying circumstances, but in most cases this will probably not be too high an estimate.

There is much more difficulty in determining the value of the fertility taken from the soil by a crop of grain, but I should say that $2 per acre would be about a fair charge. By this I mean that it would cost that much to restore it, either by barn-yard manure or commercial fertilizers. This would allow $12 worth of manure spread over an acre of land once in six years. This would certainly not be any *more* than sufficient to maintain its fertility under continued cropping with grain, and my estimate of $2 per acre for plant food removed by a crop of grain is therefore certainly not too high.

This will make the cost of growing an acre of corn or

wheat $10. Allowing that twenty bushels an acre, at $1 a bushel would be a fair average yield and price for wheat, and fifty bushels an acre and 40 cents a fair average yield and price for corn, the money value of the crop on an acre would be, in either case, $20, allowing a profit of $10 per acre on a crop of grain.

Now, we will compare this with the profit on an acre of clover. The cost of seed and growing will not *exceed* $1 per acre. A bushel of seed is sufficient for eight or ten acres of land, and 10 cents per acre will cover the cost of sowing. Preparation of seed-bed costs nothing, for ordinarily it is sown on wheat or oats and covered by the action of frost and rains. Even if we harrow the wheat field to give the clover a better chance, one-half the cost should be charged to the wheat, which will be greatly benefitted by the treatment.

Next, as to the removal of elements of fertility from the soil: Instead of—as in the case of corn or wheat—having to charge the clover with $2 an acre on this score, we can actually give it a credit of $8 per acre for elements of fertility added to the soil. How this is done will be discussed further on; the fact is sufficient for my present purpose. To prove that this is a reasonable estimate, it is sufficient to say that experience has abundantly demonstrated that a crop of clover will restore to the soil as much fertility as is taken away by four years cropping with grain. Now, as we demonstrated that it would take at *least* barn-yard manure to the value of $8 to do this, then this is the lowest estimate we can place on the manurial value of this crop.

Next, as to the market value of a crop of clover; for it must be kept in mind that the above estimate of its manurial value is made with the supposition that the crop is pastured or utilized as a meadow. Mr. Colburn, in

his book on SWINE HUSBANDRY, estimates that six tons of green clover can be grown on an acre, and fifteen pounds will make a pound of pork. Valuing the pork at 4 cents a pound, would give the value of an acre of clover when pastured at $32. This is undoubtedly an extravagant estimate.

L. N. Bonham, who has made this matter a careful study for years, estimates the value of an acre of clover, when pastured to cattle or hogs, at $9, and this is probably a fair estimate; and if, instead of pasturing, it is cut twice—once for hay and once for seed—the net value of an acre. after deducting the cost of harvesting, will certainly not be less than this.

We have now the data from which to reckon the value to the farmer of an acre of clover:

Net market value of crop	$ 9 00
Value of fertilizing elements returned to soil	8 00
Total,	$17 00
Less cost of seed and cultivation	1 00
Net profit per acre	$16 00

For facility in comparison, I now repeat the estimate on an acre of grain:

Net market value of crop		$20 00
Less cost of cultivation	$8 00	
" fertility removed from soil	2 00	10 00
Net profit		$10 00

Which shows $6 more profit on an acre of clover than on an acre of grain. To this might be added that the clover stubble is loose and mellow and free from weeds.

While of course clover cannot take the place of crops of grain, yet this estimate shows very clearly its value to the farmer, and the important place it occupies among the crops of the farm.

HOW CLOVER ADDS TO THE FERTILITY OF THE SOIL.

Many persons are greatly puzzled to understand how it can be that a crop of clover can be grown, and yield a crop of hay and crop of seed to be carried away, and still add fertility to the soil. A little thought will, I think, make it clear. I have already, in other chapters, alluded to the influence of shade on the soil, in causing the deposit of nitrogen; and perhaps there is no crop grown on the farm which produces so dense a shade as clover. Its abundant foliage takes in carbonic acid from the atmosphere, and the large roots penetrate deeply into the subsoil, bringing up and making available the valuable mineral elements needed for our grain crops.

Clover is rich in valuable ash. A careful analysis of this ash gives the following result:

Phosphoric acid	7.5
Sulphuric acid	4.3
Carbonic acid	18
Silica	3
Lime	30
Magnesia	8.5
Potash	20
Soda, chlorine and iron	8.7
Total,	100.0

The reader will understand that the above is an average of several different analyses, as different samples will vary according to the soil on which they are grown.

The roots are still richer in ash than the tops, and consequently, in the mineral elements needed, and when we find out the proportion of root to top, we shall begin to understand why the clover crop enriches the land, even when cut for hay and for seed. Carefully conducted experiments have shown that the weight of roots is much greater than of tops. Dr Voelcker, of the Royal Society

of England, selected an average square yard in a field of clover that had been cut twice—once for hay and once for seed—and found that in the first six inches of the soil the clover roots, after being washed and dried, weighed one pound, ten and one-half ounces. This would give, in round numbers, three and one-half tons of clover roots in the first six inches of the soil, and, as fully one-third of the roots lie below this, we can estimate over five tons of clover roots in the soil of a single acre. These experiments also showed that the weight of the clover roots doubled between the time the crop was cut for hay and when it was cut for seed.

It has puzzled many farmers to understand how clover, which contains so large a per cent of the same valuable elements which wheat does, could enrich the soil and benefit the wheat crop as they find by practical experiment that it does. The fact of the large quantity of roots left in the soil, and that the clover gets its nutriment so largely from the atmosphere and the subsoil makes clear what seemed mysterious.

There may be enough fertilizing elements for hundreds of crops, lying in the soil, either out of reach of the roots of plants, or in a form not available; and clover reaches down and brings them up and renders them available; just as there might be scattered over the ground bones containing enough rich fertilizing material for several heavy crops of wheat, but which the plants could not use. If these bones are ground to a powder and incorporated with the soil, they would then be available to the plants.

So there are in the subsoil and air almost inexhaustible supplies of plant food, but which, like the unground bones, are not available to the ordinary plant. The clover seizes these elements and makes them available.

In the beginning of this article I made an estimate of the fertilizing value of an acre of clover from the practical standpoint Now let us see what the value would be from a chemical standpoint. The value of potash, ammonia and phosphoric acid as contained in commercial fertilizers, is usually estimated to be:

Ammonia	17½ cents	℔ lb.
Potash	6 "	"
Phosphoric acid	6 "	"

From a careful comparison of a number of tables, I estimate that the roots of an acre of good clover will contain:

Ammonia,	145 lbs. @	17½ cents,	$25	37
Potash,	140 lbs. @	6 cents,	8	40
Phosphoric acid,	42 lbs. @	6 cents,	2	52
			$36	29

This shows that my estimate from a practical standpoint was not extravagant. It must be borne in mind, however, that a part of this value retained in the roots, must be allowed to replace what was carried off in the tops, and that of course a portion was gathered from the surface soil. The real fertilizing profit is in that portion that is drawn from the air and subsoil.

There is one other benefit of clover, difficult, perhaps, to estimate, but which farmers are not slow to appreciate, and that is its mechanical effect; and this does more than make the land work easily, for it also enables the roots of other plants to traverse the soil and find food, which they otherwise would be unable to reach. Clover is also a cleansing crop, by which I mean that it so fully occupies the land that it does not allow any other plants to grow, and the seeds of many troublesome plants will sprout and then be smothered by the dense growth of clover, and perish.

GETTING A STAND.

If all said above is true of clover—and those who have had the most experience with it, will testify to these facts—farmers cannot well sow too much of it, and it becomes a matter of moment to know how to insure a stand. I believe that moderately early sowing will generally be found the safest; but localities and seasons vary so that no date can be given. It should be sown early enough so as to be covered by the action of frost, and yet not so early as to be in danger of heavy frost after it comes up, as it is sometimes killed. If sown late, after the probability of frost is over, it is best to harrow the wheat, as this will give a better seed-bed for the clover, and at the same time be of benefit to the wheat. Many farmers are afraid of injuring the wheat in this way, but I have used a heavy, sharp harrow without injury. Perhaps it would be better to use the Thomas, or some other slope-tooth harrow, and go over it both ways; but I should use a common tooth harrow if I had no other. It is of such vital importance to the farmer to get a stand of clover, in order that his rotation may not be broken up, that it will be profitable to take much pains in sowing clover, and I think it will pay to sow early and cross sow a little later, using, of course, but half the seed at each seeding. Ordinarily both sowings come up and do well, but if the first sowing should be killed by a late freeze, the second would be likely to do well, and should the weather come on dry and hot, the early seeding would be out of danger.

When the farmer saves his own seed and sows in the chaff, as is often done, I would always recommend early sowing, as the seed will be slower in germinating, and the hull will also be a protection to the young plant.

The quantity of seed to the acre must vary some-

what with the soil and condition of seed-bed; but under favorable circumstances a bushel will seed ten acres well, and this is the amount of seed most commonly sown. I prefer generally to seed heavier, and I notice that those who follow thrashing clover seed report the heaviest yield from heavy seeding, and some of them recommend ten pounds to the acre.

SAVING CLOVER SEED.

I have no hesitation in advising farmers who can to save their own seed. It is not only economical, but also safe; for many farmers, by buying seed, have introduced troublesome weeds, to the great detriment of their farms. Much seed that is old and worthless, or that is adulterated, is put upon the market, and doubtless many farmers who fail to get a stand, attribute it to the season, when it is really caused by poor seed.

Clover seed is usually a profitable crop to grow for sale, as good clover ought to average two bushels of seed to the acre, and double this has often been grown; but even when not grown for sale, the farmer can grow enough for his own use, and sow it in the chaff, and I think that when sown early in this way it is surer than the clean seed. When a crop of seed is wanted, the first crop should be cut early in June; the second will then be ready the last of August or first of September, which will be known by three-fourths of the heads having turned brown. It should be left by the reaper in bunches large enough for a good sized fork full. Do not let it stand till too ripe, or try to handle it much, or you will lose much of the seed. It is best to thrash from the field in a dry time, as it is difficult to stack so as to keep out the water, and it is too dusty to be pleasant in the barn. The waste will be valuable in the compost heap, or will make an excellent mulch for

the wheat or anything to which you wish to apply it.

CLOVER HAY,

Is excellent feed, especially for milk cows, but may be greatly injured, either by too much drying or too much wet. If dried too much, the leaves crumble, and the best part of it is wasted; or if left out in the rain, or put in the mow so green as to mould, it is unwholesome and unpalatable. After clover is fairly wilted, it should be cured in small cocks. It may be put in the barn quite green, if you have dry, old hay, or straw, or corn fodder to put between the layers, as they will absorb the moisture. If clover is cut green, it cannot be safely put in the barn with one day's curing without an absorbent.

VARIETIES OF CLOVER.

For general purposes, the common red is the best variety; but my experience with the Mammoth has been favorable, and I recommend farmers to experiment with it. It makes a larger growth of top and of course of root, and when the crop is grown with reference to its value for manure, it will certainly furnish a greater bulk than the common red. When the season is dry, it makes excellent hay, but in a wet season is apt to grow coarse and woody, and so rank as to lodge and be badly injured. I have cut three tons of it to the acre, cured, and the hay was equal to any clover. Where a little clover is wanted with timothy, it is best to sow this variety, as it ripens about with that grass. One and a half or two pounds of seed to the acre is enough when sown with timothy, as, if you get on much more than this, it will smother it.

Alsike clover is a medium variety, finer than the common red, with heads half way in size between that and white clover. It makes fine hay, and will cut a fair swath, and furnishes, like the white, good bee pasture.

The seed sells at about 25 cents a pound, but it is so fine that much less seed than of red clover will sow an acre. White clover is very seldom sown, but I think farmers would find it profitable to sow on poor spots where it is difficult to get a stand of grasses, or on washy places on hillsides, as it is tenacious and seldom killed out when it gets a foothold.

The reader will notice that I have not recommended plowing under the crop for enriching the land. It may be profitable under some circumstances, but ordinarily it will be worth more for other purposes, and as has been already shown, we get the mechanical effect and a full development of the roots, which are the most valuable part when we utilize the crop both for hay and seed. I would not, under any circumstances, plow under a heavy growth of clover late in the season on land that was to be sown in wheat. I have known in several instances a total failure of crop from so doing. A moderate growth, especially if plowed under early, is not objectionable; but if a great mass is turned under late in the season, it is impossible to get a proper seed-bed. If I wanted to utilize the entire crop for the benefit of the land, I should rather let it stand all the season, without either cutting or pasturing, and if it was dry enough, so that it could be burned off by the last of August, I should burn it if I intended to sow in wheat, and then mellow three or four inches of the surface and sow the wheat. The largest crop of wheat I have ever heard of being grown in Ohio, and which averaged over sixty bushels to the acre, was where a field of Mammoth clover was burned. I think I should burn this crop also in the spring, if I were intending to follow with corn. Another way highly recommended, when the entire crop is to be utilized for fertilizing purposes, is to cut the first crop and leave it

as it falls, allowing the second crop to grow up through it.

When pastured, clover should not be turned on too early or too heavily stocked, as if too closely cropped we lose the benefit of shade and development of root, and consequently its value as a fertilizer is greatly reduced.

One other point connected with the pasturing of clover is, that it sometimes causes bloat or hoven in cattle, so as to produce fatal results. Fortunately, I have had no experience with it on my farm, but I remember when a boy, my father lost a valuable cow, and I have known cases where a farmer has lost several head in a season. It is not prudent to turn hungry cattle into a clover field the first time in the spring, when the dew is on in the morning. I have talked with many farmers on this subject, and find that I can never hear of a case of bloat when the pasture contains a strip of blue grass or timothy, and as my pastures have always contained other grasses as well as clover, this may be the reason I have escaped it. Another preventive, which many farmers consider infallible, is to have a straw stack in the field, to which the cows can have access.

CHAPTER XIV.

POTATOES.

While potatoes should find a place on every farm, there are serious drawbacks to growing them largely as a field crop. They cannot, like grain, be kept over a year or more; but must be sold, whether the price gives a profit or not. It is a risky crop, also, more easily affected by drought, and often entirely ruined by continued wet weather; and as potatoes must be wintered in the cellar or in pits, they are far more expensive to handle than grain.

Notwithstanding these disadvantages, the crop is a profitable one to the farmer who understands its proper management, and who follows growing it persistently, not allowing himself to be frightened into abandoning it by a failure or unprofitable season. It is certainly a safe estimate that two bushels of potatoes can be grown on the same land which would produce one of corn, and at an average price of 40 cents per bushel, the farmer would find them profitable.

There seems to be a tendency to degeneration in the potato, which results, where a variety is planted for many years on the same soil, in "running out." But by selection and hybridizing, new and more valuable varieties are as constantly being produced, which replace those which have to be abandoned.

It would be useless for me to give a list of varieties, for not only is their name legion, but each neighborhood

has its favorites, and the variety that does the best in one locality may not succeed in another. The farmer who would succeed with potatoes, should test some of the newer and more promising varieties each year, and while he is thus "proving all things" should also "hold fast that which is good." A single pound of seed will, if properly managed, produce a bushel or more, and enable him to test the quality and grow enough the second year to plant a field.

The first requisite for growing a profitable potato crop is a rich soil, and as the principal mineral element wanted is potash, and clover not only furnishes it, but also gives just the mechanical condition of soil wanted, a clover sod makes an excellent potato patch. The earlier the variety of potato the richer the land should be, for the less time a plant has in which to gather its food, the more concentrated and readily available that food must be. A variety of potato, which, like the Peachblow, does not mature till late in the fall, will produce paying crops on poor land, on which an early variety would scarcely produce a crop worth digging.

I believe in deep planting of the potato, and always use, for laying off potato land, a shovel plow with a long point, which not only makes a deep furrow, but leaves loose earth in the bottom of it. I then step on the seed, pressing it down to the bottom of the furrow, cover with the plow, and before the potatoes come up, cross harrow. This kills the weeds which are starting, and loosens the soil, and if it does not make it sufficiently level and smooth, we put on the roller, for as soon as the potatoes can be seen in the row, we want to work as close to them as possible.

For early potatoes, I prefer to plow in the fall and manure at the surface, and in the spring work this manure

into the soil before planting.* The best remedy I have ever found for the Colorado Beetle is a thrifty plant; and I have never had the crop materially injured if the ground was rich, the cultivation thorough, and the season good. If the weather is dry, so as to check the growth, it may be necessary to use Paris green, and I very much prefer to use in water. A single application made in this way, using less than two pounds to the acre, during the dry summer of 1881, saved my crop, as was proven by the fact that the adjoining rows, left without this application, were entirely ruined.

I believe that as a rule, farmers use too much seed. One piece with two good eyes in a hill is sufficient. I believe the best way to save seed is to select each year very carefully, a bushel of "stock seed." They should be fair, large tubers, as near perfect as can be found; from these select tubers grow your seed for the coming year, and from their product again select your "stock seed."

I have conducted some very careful experiments, which prove that a fine crop of large potatoes can be grown from very small seed, and while I recommend the plan given above for selecting seed, I do not hesitate when potatoes are scarce and high, to plant very small seed.

My first experiment was in 1857. I had grown a very fine crop the previous year, and did not sell till spring, and when marketing in April, I selected one bushel of the most perfect potatoes I could pick out of one hundred bushels. I rejected any potato that weighed less than a pound, or that had a blemish or rough place on

*Our most successful potato-growers are very particular about having the soil as rich as possible, and consider it a crop that not only can scarcely be manured too much, but that few crops pay better for being manured. R. S. T.

it. I then selected a half peck of the meanest little potatoes I could find. Not one of them would have weighed an ounce, and where I could I broke off the protuberances from the rough, knobby potatoes. I planted five rows side by side from each kind of seed, gave them the same cultivation, and when I dug them put them in two piles side by side, and called four men who were building a barn near, to examine them, telling them of the selection of the seed, but not which pile grew from the large or small. The three journeymen said they could see no difference in quality or quantity, but the boss carpenter made a careful comparison and decided that the north pile was of the best quality, which I then told him grew from the small seed.

In the spring of 1860 potatoes were high and I found that I had not seed to finish what I wished to plant, and I used as seed some very small potatoes, which I had put in the cellar to cook for the pigs. I planted about half an acre from this seed. The crop grown from them was an excellent one, both in yield and quality. Some years later I planted a row of Early Rose potatoes from seed so small that it took ten to weigh an ounce, and the adjoining row from good sized seed, and found no difference in the yield.

I consider it important that the seed should be fresh and plump. I do not like a shriveled potato for seed; it does not start the plant with vigor; and I think it much better to winter seed potatoes in pits than in the cellar. If the soil is dry, or slopes so as to give good surface drainage, there is no trouble in wintering in pits, and there is much less labor about it than in carrying them into and out of the cellar. Much time can be saved in handling potatoes by assorting as they are dug. Let the men who follow the diggers pick up

only the merchantable potatoes and pour them into sacks, only one bushel to the sack. When you are ready to haul them to the pit, two men can load or unload a wagon in less than ten minutes, and the potatoes will not be so likely to be bruised. I am particular about having but one bushel in a sack, for then they will not need to be tied, and it will not take as long to load and unload as it would to tie and untie the sacks, and they can be handled with much greater ease.

In pitting potatoes, I prefer to put no straw next to them. If I have a supply of good coarse manure, I cover simply with eighteen inches of mellow earth, and as soon as the ground freezes so as to bear a team, put a foot of manure over them. If I do not use manure, I cover with six or eight inche of earth and then a coat of straw and eighteen inches of earth over that. I consider this safer than to have the straw next the potatoes, for if the straw gets damp, as it is likely to, and the frost reaches it, it is pretty sure to go through it, but is not likely to penetrate the second covering of earth.

As there is both labor and risk in wintering potatoes, and it is impossible to know what the price will be in spring, I think it safest to sell in the fall—at least half the crop, if a paying price can be had. I once wintered four hundred bushels of potatoes that I was offered 80 cents a bushels for, and in the spring I could not get an offer, and was obliged to feed them to stock. This experience made me cautious and I have never held over all of a crop since.*

*A plan of growing potatoes much in use in some section is planting them under straw. The potatoes are planted shals low and a foot of straw spread over the field. Another plan is to simply lay the potatoes on top of the fresnly plowed land and cover with straw as before, though I have less seldom seen this plan successful. The advantages are that the straw keeps

SWEET POTATOES.

I have found sweet potatoes a uniformly profitable crop.

Although the usual instructions are to plant on sandy land, I have had the best success on a rather stiff clay, and can always confidently expect both a good yield and quality, even on thin land, if I have fine rotted manure to give it a moderate dressing. The most successful sweet potato-grower of my acquaintance does not break his land, but ridges it, leaving the land hard underneath. I should do this if it was not troublesome to get the land fine and mellow when in this shape; but I prefer to plow shallow—not over four inches—and stir and roll until the soil is perfectly pulverized and the manure thoroughly mixed. I then make small ridges by throwing two furrows together with a one-horse plow, and leave a little strip of earth between the ridges, as we shall want it to dress the plants with when we come to hoe them.

Most sweet potato-growers plant in a row on this ridge, and it saves time, for you can get the soil in such excellent order that you will not need to touch it with a hoe. I am convinced, however, from repeated comparison of hills and drills, that it will pay to make small hills. A hand will make from twelve to fifteen hundred in a day, and I find the potatoes are larger and the yield greater in hills than in drills. I make the hills about three feet apart each way, a little more between the rows,

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down the weeds, saves cultivation, and undoubtedly enriches the land. In Southern Illinois where I have tried the plan year after year the straw would always be so fully rotted at the end of the season, that it gave no trouble. In the drier atmosphere of Ohio I find this is not always the case. The plan usually gives a rather smaller crop than when cultivated, but more good potatoes. R. S. T.

and a little less in the row, and this gives nearly five thousand hills to the acre, and a pound of merchantable potatoes to the hill makes over eighty bushels to the acre.

We have several objects in view in this shallow plowing and small hills: First, they warm through better, and the sweet potato being a tropical plant, cannot flourish in a cold soil. The weather is rarely too hot or too dry for this crop. Second, we want the potatoes to grow thick instead of long, and when they reach the hard soil underneath, it checks the lateral growth and gives a better shaped tuber; and, third, in growing thick instead of long, they crack and loosen the hill, and this keeps it in good condition after the vines have spread so that cultivation is impossible.

I think it pays to keep the vines on half the ground, keeping every other space clear. This gives the hills more sun, and it is much easier to dig the potatoes, and enables you to bury all the vines as you dig. We use the potato hook in digging, and one stroke to a hill will generally do the work. In digging, take two rows at a time, walk on the vines and draw the hills towards you from each side, and by a little trouble you can bury every leaf.

KEEPING SWEET POTATOES.

I have found that if sweet potatoes are mature and thoroughly dried, there is no trouble in keeping them in a dry cellar nearly all winter, but they should be handled as carefully as eggs, for if bruised they are sure to rot. The potatoes which I intend to keep for winter use I spread out singly in the hottest sunshine for two or three days, and then pack in barrels, with dry sawdust between the layers. Immature sweet potatoes are not wholesome, but when thoroughly ripened they are an excellent article of diet.

SPROUTING SWEET POTATOES.

If you intend to grow sweet potatoes in any quantity, you should always grow your own plants. With even fair success, it will be much cheaper than buying them, but even if it cost more I would recommend it, as better plants can be grown, and then you can take advantage of morning and evening or a damp day to transplant, and the plants will always be fresh. Most of those who grow plants for sale crowd them in the bed until they are spindled and weak; but in growing for yourself you can regard quality rather than quantity, and give them plenty of room.

It took me ten years to learn to sprout sweet potatoes, during which time I lost a part or all my seed nearly every year. For many years I have been uniformly successful, and I believe I can give instructions which will enable the novice to be successful from the start. I think nine times out of ten when sweet potatoes rot in the bed, it is from an excess of heat, and if you have as much bottom heat as you need, and allow the sun to heat up the bed from above, it is almost certain to result in scalded potatoes. I have never lost the potatoes or failed to get a good sprout since I adopted the plan of covering the bed with straw or corn fodder. This enables me to control the temperature, and also keeps the bed moist, so that it will need no water until the plants begin to come up, when we remove the covering and do not replace it; but if there is danger of frost, cover the bed with boards. If at any time you find the bed lacks heat, take off the straw at nine or ten o'clock on a bright, sunny day, and sometime between twelve and two, when you find it warmed up, replace it. I make a sweet potato bed flat, and put hot manure one foot deep, and two feet wider and longer than my frame which I put on

the manure. If you put the manure in the frame, the outer edges of the bed are likely to be cold. The manure must be thoroughly shaken up, so as to have no lumps, and must be well packed, but instead of tramping it, take two short pieces of board, and moving one ahead of the other alternately, pass from end to end, springing up and down on the boards. This will pack it evenly. For a frame use inch boards one foot wide. A convenient size for the bed is six by sixteen feet, which will hold, as ordinarily put in, one barrel of potatoes. There should be four inches of earth between the potatoes and the manure, and three inches above them, and the seed should never be put in the bed until it is about blood heat. Water copiously when the plants are coming up, but it will harden them to withhold water when they are large enough to set out; but the bed should be well soaked a few hours before the plants are drawn. If you do not break the roots of the potatoes in taking up the plants, you will have a second drawing in about two weeks.

The usual time for putting the seed in the hot bed is the middle of April; but if early potatoes are wanted, a few should be started in March and transplanted into small pots, and these plunged in a fresh bed, by which means some weeks can be gained. Sweet potatoes bear transplanting well, and if the land is in good condition and plants properly set, nearly all will grow. In setting out the plants, puddling is much better than watering, besides being less trouble. In making the puddle use fresh cow dung and enough clayey soil so that it will adhere to the roots. Stir and thicken until it is of a consistency to coat the roots thickly when dipped into it. Put one plant in a hill; set it deep and crowd the earth so tight at the roots that if you take hold of a leaf

and give a quick jerk, a piece of the leaf will break out instead of the plant coming up by the roots, then with hands on each side of the hill, draw up the mellow earth so as to leave but an inch or so of the plant above ground, and almost every plant will grow. In cultivating, all that is necessary, if you have followed my directions, is to keep down the weeds, for the potatoes, when they grow, will crack the hill and make it loose.

CHAPTER XV.

RYE ON THE FARM.

ITS VALUE AND USES.

I do not consider rye a profitable crop to grow for grain, and usually prefer to buy my seed rather than to raise it, and yet as a crop I value it highly.

It is hardy, useful for a great many purposes, and can be grown at but little expense.

I have already spoken of it as a green manure and of the fact that it can be grown for this purpose between two crops of corn without losing the use of the land a season. The straw brings in our city markets nearly as much as the best timothy hay, and the market is never overstocked with it.

The railroads refuse to carry rye straw unless baled, but the farmer who lives near a city so that he can wagon it to market will find it a very profitable crop.

Rye is of great value for pasture, and stock can be turned on it two weeks before any other pasture is ready and it will furnish a large amount of feed. Sometimes, on account of a dry spring, we fail to get a stand of grass or clover, and this is a great disadvantage, as our rotation calls for the pasture field of one year for the corn field of the next. Rye helps us out of the difficulty. We can plow the stubble field and seed with rye and timothy, or take the stubble field for corn or wheat, and seed a corn field with rye and timothy for the pasture. The rye will furnish early feed, and the timothy will not be

damaged by the tramping, and by the time the rye is too old, will furnish good food.

Rye is useful in preventing washing. If a gully has started in a pasture, rye can be scattered on the bottom and sides, and when it starts to grow it will protect the young grass and hold the soil until a sod forms.

Rye straw makes the best possible material for binding corn fodder.

Early cut rye straw is an excellent food for horses, when cut up. It is soft, bright, free from dust, nutritious, and makes a good substitute for sheaf oats.

I have seen a statement of two crops of rye grown in Massachusetts, that produced over four tons of straw to the acre. This was the result of liberal manuring and heavy seeding.

CULTIVATION AND MANAGEMENT.

The cultivation of rye is extremely simple. It should be sown at the same time of year as wheat, but the exact date of planting is of much less importance. It can be sown among corn immediately after the last plowing, if the cultivation has been continued late, and left to take care of itself; and I have made a good crop when sown so late in the fall that it did not come up till the ground thawed the following spring. It will grow even though only scattered on the surface of the land and left uncovered, though of course it is better to treat it with more care.

I have seen the statement, though I could not vouch for its truth, that rye scattered broadcast on a tough prairie sod will grow, and so completely root out the prairie grass that the land can be readily plowed the following year. Land must be poor, indeed, on which rye will not grow; but of course when grown as a fertilizing crop, the more barn-yard manure can be applied as

a top dressing at seeding, the greater will be the improvement of the land. When sown for grain, I would sow from three to four pecks to the acre; for straw or pasture, somewhat heavier, and for fertilizer, as much as three or four bushels to the acre.

I always cut rye when in blossom, which, in my latitude, is from the middle to the last of May. The straw is tougher and more pliable if cut then than if the grain is allowed to ripen; and moreover, in using the straw for bands in tying fodder, you will not get the corn field seeded down to rye, which is a great drawback if you sow wheat on your corn land. I never could get rye straw thrashed so clean that it would not scatter seed afterward, if the grain had been allowed to ripen.

If clover is sown with the rye, the early cutting I have recommended gives the clover a long summer in which to develop, and it will make quite a crop to turn under for corn the next year.

I should expect land to steadily improve, growing a crop of corn and a crop of rye straw alternate years, provided clover was sown with the rye.

CHAPTER XVI.

SPECIAL CROPS.

There are quite a number of crops, which, though not grown on every farm, are nevertheless in many cases profitable.

BARLEY.

The same rules laid down for wheat will be applicable for barley.

OATS.

Like wheat, oats require a compact seed-bed, and on corn land it is best not to plow, but simply to cultivate the soil with some of the improved harrows or pulverizers, until the surface is thoroughly mellow. Even on stubble land some of the best crops have been grown by simply cultivating with the double corn plow, or harrowing and cross harrowing with the Randall Harrow, or some similar implement. The great point is a compact seed-bed with a well pulverized surface.

Sow as early as the ground can be worked. I once sowed in February on a piece of flat clay land, and the month following was so excessively wet that the land was like mortar, and the weather then turned cold, snow fell, and thermometer went down to eight degrees above zero, and yet I got a good crop.

FODDER CORN

Can be made a crop of much greater value and importance than some farmers are inclined to believe. There should be at least a small patch grown on every farm, so

as to furnish the cows feed in case of a dry spell and consequent short pastures. I believe that an acre of land will produce more food in this crop than in any other that can be grown on it.

But by fodder corn I do not mean sowed corn, which I consider very poor food for stock. Sowed corn has to be cut while immature, and therefore innutritious, and is very troublesome to cure.

Fodder corn, planted as I shall recommend, will develop so as to make sweet, nutritious food, and in favorable years will mature small ears, which will greatly add to its value.

George Waring, in his experience with dairy stock on Ogden Farm, was so pleased with it that he wrote:

> "Corn for grain, never;
> Corn for fodder forever!"

Fodder corn may be planted quite late. I have grown heavy crops on land from which the early potatoes had been dug; but June is about the best time. It is most easily planted with a drill; and with a force-feed wheat drill from two to three rows can be planted at a time. The rows should be three feet apart, so as to admit of cultivation. Do not get it too thick in the rows

Blount's Prolific is the most profitable variety for fodder, as it produces several small ears to the stalk and a large quantity of blades. Stowell Evergreen is excellent, but any field variety will do.

As soon as fully grown, and the ears beginning to harden, fodder corn can be cut up and shocked as other corn, and when cured can be stacked or hauled into the barn.

BROOM CORN.

This crop requires a large amount of labor, but is often very profitable. The man with a small farm will

sometimes find employment for winter and largely increase his profits by growing this crop and manufacturing it himself. The machinery for manufacturing costs but a few dollars, and the business is easily and quickly learned.

Broom corn requires a warm, rich soil. The best corn and barley land is suited to it, and it is very important that the field be clean, as the plant comes up small and weak and starts rather slowly.

Be sure to have good seed. I would put it in water, and reject all that would not sink, even though it took ten bushels of seed from which to get one.

Do not plant till the weather is settled and the ground warm. I prefer to plant by hand, in rows three feet apart, making a hill every two feet in the row, with from six to ten stalks in the hill. This gives much more labor than drilling, but you save the subsequent labor of thinning, and it is easier to cultivate and "table."

Cultivation should be thorough, and no weeds be permitted to grow. If your land is clean and you have fenders to your plow so as to enable you to get close to it while young, a crop can be grown without hoeing; but it is better to hoe than to allow it to become weedy.

As soon as it is fully grown it is ready to cut, and the brush will be worth nearly double what it will be if the seed is allowed to ripen. Before cutting, it is "tabled" —by which we mean that two rows are broken about two feet from the ground, so that the stalks fall diagonally across each other and the brush projects into the intervening spaces. When the brush is cut it is laid on these "tables," which form an excellent place for it to cure, as the air can circulate through it and the water run off. As soon as possible after cutting, it should be scraped and cured in sheds on racks, as this makes it tough and pliable.

A supply of these racks must be kept on hand, and it therefore does not pay to grow broom corn unless you expect to follow it regularly. These racks should be moveable, so that the sheds can be used for storing fodder or other purposes, when not in use for the broom corn.

An average crop is about five hudred pounds of cured brush per acre; but on good land this is sometimes doubled. The price fluctuates greatly. I have known it to sell for three hundred dollars a ton, and as low as forty; but it usually brings a paying price and can be easily stored and held over when the price is too low.

NAVY BEANS

May often be grown at a profit, and leave the ground in excellent condition for wheat. After the bean crop has been harvested, the ground needs only a thorough harrowing, and will produce as heavy a crop of wheat as can be grown on it.

The land should be plowed early and worked occasionally, to kill the weeds and get it in good condition. I usually plant about the tenth of June, using the wheat drill, stopping enough hoes to make the rows about two feet apart. From three to four pecks of seed are required for an acre.

The crop should not be allowed to become weedy, but will need little cultivation, as it will soon so shade the ground that nothing else will grow. The beans usually ripen about the first of September, but sometimes will keep green a week or two later. In this case they may be pulled while the pods are yet green, and cured in the barn, or stacked and cured in the field. To stack it, set up a stake in the ground, sharp at the top. Arrange some sticks of wood around the stake to keep the beans off the ground, or put two long pins through it in oppo-

site directions, about a foot from the ground; then slide the beans down over the point of the stake till it is full to the top. Unless the weather is exceedingly bad, they will cure perfectly.

PUMPKINS.

I have found this a profitable crop for fall feeding. They come in at a time when pasture is usually short, and are a valuable feed for both cattle and hogs. Fed to cows, they increase the flow of the milk, improve the quality and the color of butter. There is a prevalent opinion that the seeds must be removed in feeding to milk cows, or they will check the flow of milk, and there is considerable evidence to this effect; but in a long experience I have not found this to be the case.

For hogs they are not only highly fattening, but supply the need for variety, enabling them to relish other food better.

They are usually grown in the corn field, a little seed being mixed with the corn in the hopper of planter or drill; but I prefer to grow alone, and as, with moderate care, they are wonderfully productive, a very small piece of land may be made to produce all any farmer can use, and the trouble of having them among the corn avoided. By the use of manure in the hill, they can be grown on quite poor land.

Plant in hills eight feet apart each way, manuring liberally in the hill if you wish a heavy crop. Use plenty of seed, as it is cheap and not always certain. When the plants are thoroughly established, thin to three in a hill, which will be sufficient to cover the land. Do not plant till the weather is quite warm and settled, my best crops have been planted the last of May or first of June.

For variety, I prefer the yellow-ribbed, known as the "Yankee Pumpkin," it is more productive than the variety usually grown at the West, and the flesh being thinner and less firm, cattle can eat them without chopping.*

ROOT CROPS.

More of these would be profitable on many farms, and are excellent food for dairy cattle; in fact, for stock of almost every kind.

MANGOLDS, or sugar beets, are the best and most prolific of all, and do not impart any objectionable flavor to the milk of cows fed on them. Five hundred bushels to the acre is a moderate yield, and more than double this has been grown. The Yellow Globe Mangold is the best on most soils; but I would advise the beginner to try different varieties and see which suits his particular soil the best. It is well to begin any new crop on a small scale, and increase as you gain experience.

They require rich land, and give a liberal return for liberal manuring. Plow in fall into beds twelve to twenty feet wide, and so arranged that the water will run off. If your manure is coarse, plow it under in fall, but if fine and well rotted, save it and apply as a top dressing in the spring.

As early in the spring as the ground can be worked nicely, mellow your beds and put in the seed in rows two and a half feet apart. Plant just as early as the weather will permit. I always get them planted in March or

*We are surprised that Mr. Brown, with his Yankee extraction, should have failed to mention one of the great uses of the pumpkin, namely, pumpkin pie. The great problem is, how to keep them, so that this delicious article be not restricted to Thanksgiving and Christmas. If a few choice sound pumpkins be laid on a shelf in a dry cellar, safe from frost, and each be turned over every day, they can in many cases be kept for many months. The rotting of the pumpkin is caused by the water in the flesh settling to one side. R. S. T.

April if possible. The frost will not injure them.

As soon as the plants are large enough, thin to one foot apart in the rows, and if any vacancies are found, fill them by transplanting. This early thinning is important, as the crop will be greatly damaged if not thinned at the proper time.

Keep the land clean.

The distances I have recommended will give over seventeen thousand plants to the acre, and at an average of two pounds each, would furnish nearly six hundred bushels.

The crop may be stored in the cellar, or pitted, like potatoes. The best time to use them is the latter part of winter, as they go through a ripening process which improves them, and cattle are more in need of a loosening feed at that time.

Turnips.—The common flat turnip is the easiest grown of all the root crops, and I have sold single crops for more than the land on which they were grown was worth. I have grown five hundred bushels to the acre, and often two hundred and fifty and three hundred. When the crop can be sold for anything over 20 cents a bushel, it is very profitable, and I have sold them by the car load at 33 cents, and by the wagon load at 60 cents per bushel. The crop can be grown so cheaply that if you get a fair price once in three years and feed to cattle the other years, it will pay to grow them.

The actual cost of growing and pitting when you get a good yield, will not exceed 5 cents a bushel.

Many persons fail in growing turnips from lack of a knowledge of the requisites of success. The essentials are that the ground should be moderately rich, well compacted, and mellow on the surface, and that the turnips should come up quickly and get the start of the weeds.

It is useless to sow turnips on the surface of a freshly plowed field. The more hard, beating rains it has after plowing the better, but it must be free from weeds.

It was the practice in New England half a century ago, to plow the turnip land in the spring, fold the sheep on it all summer, and then merely loosen the surface with a harrow sufficient to enable the seed to be covered. This secured—the packing of the land by the tramping of the sheep, its fertilization by their droppings, and also protection from the turnip flea, as the oil from the wool destroys them.

I recently heard of this plan being tried in Ohio: A piece of stubble land was plowed in July, and the sheep turned on it each night till planting time. Part of the land being a little muddy, the sheep avoided it, and lay every night on one side of the field. On that side a heavy crop was grown, while on the side avoided by the sheep the crop was entirely destroyed by the flea.

I like to plant on a clover sod, from which a crop of clover has been cut. This should be plowed in June, and repeatedly rolled and harrowed, for the double purpose of getting a compact bed and destroying weeds. If you can also fold sheep on it part of the time, as above suggested, of course so much the better. If the land is poor, it should have, before planting, a light dressing of well fined manure, or about two hundred pounds of superphosphate per acre.

The best time in this latitude for sowing turnips is the first week in August, but if the weather is favorable, it will do to sow a week earlier or later. In a favorable fall they will bottom if sown the first of September.

When the time for sowing has come, wait for a rain, and as soon after the rain as the ground can be worked without packing, sow, and cover by drawing a plank

over the land. This smoothes the surface, presses the soil against the seed and insures quick germination. If you are planting several acres, a horse can be hitched to each end of a sixteen-foot plank and a quick job made of it. Many persons prefer planting just before a rain, so as to let the rain wash the seed into the soil. This saves the labor of covering, but often loses the crop. The rain forms a crust which prevents the plants from making a thrifty start, and destruction by the fly is often the consequence; and if the plants do grow, the weeds get the start with them. When sown as I direct, *after* a rain, the plants come up thrifty and strong and get the start of the weeds.

Turnips can be pitted in exactly the same manner as directed for potatoes.

They form an excellent feed for cattle, but in many cases it is found that when fed to milk cows they impart a disagreeable flavor to the milk. It is claimed by some that this can be avoided by only feeding them immediately after milking.

CHAPTER XVII.

FRUIT ON THE FARM.

THE VALUE OF FRUIT.

Every farmer can secure from fruit not only enjoyment, but health and profit, and it has been a surprise to me that so many of our farms are destitute of this luxury.

I see many farms on which an inventory of the fruit trees would show nothing but a neglected apple orchard —which probably was planted before the owner was born —a few sour cherries, surounded by a wilderness of sprouts, and possibly a few seedling peaches, either in the calf pasture, or allowed to grow in the fence corners, where they will not take up room that could be used for corn and potatoes.

Not only is an abundant supply of fruit a great luxury, but it forms a cheap and healthful article of diet, and one that can be enjoyed the whole year through, for a constant succession may easily be secured from the time we gather the first strawberries till the last clusters of grapes are eaten, and then we can have the closets stored with canned fruit, and the cellars filled with winter apples.

The health of our people would be better if more fruit was annually consumed.

Nor is it a difficult matter. The same care and common sense needed to produce a crop of corn will insure success in the production of a crop of fruit.

In addition to the apple orchard, there should be a

fruit lot on every farm, containing cherries, pears, plums, quinces and peaches. Raspberries, currants and strawberries should have their place, and grape vines should cover the outbuildings, or run on trellises along the walks and drives.

I have on my farm such a plat, containing less than an acre, and for the past five years it has not only supplied all the fruit we could use in the family, and allowed us to put up each year a liberal amount of canned fruit, but we have also sold an average of over $60 worth of fruit a year.

A curious fact connected with this last item is that most of this fruit has been sold to farmers who could have bought the trees and set out a fruit lot the same size as mine for less than what they pay me each year.

FRUIT FOR PROFIT.

There is always a market for really fine fruit, and fruit-growing is a business I would recommend to the young man of enterprise, if he is within reach of a good market and will take the pains to make himself acquainted with the business. A small amount of land will bring a large income in good seasons, and if it contain a general variety of fruit, some will be sure to produce every year.

Before planting largely, visit and consult with the fruit-growers of your neighborhood. Even farmers who grow little fruit may be able to give you valuable advice on the varieties to plant. It would be folly to plant blackberries extensively where the rust prevailed, or plums where there was black knot, or pears where blight was destructive.

Were I going into the business, and had ten acres of suitable land to plant, I would set one acre (160 trees) in Early Richmond cherries, one acre (160 trees) in

Shropshire Damson plums, one acre (302 trees) in quinces, one acre in grapes in variety, setting the rows north and south, and planting strawberries between. One acre I would reserve for garden and experimenting with new varieties of strawberries, and five acres I would plant in winter apples and in peaches, giving 200 trees of the former and 600 of the latter. I should not attempt to set out all these in one year, nor in two; but should put out each year what I could do well and take care of.

My reason for the proportion given is, that I know how these trees succeed in my locality and the prices they command in the markets I have access to. Here peaches bear fully half the years, grapes and quinces nine years out of ten, cherries of the varieties named four years out of five, and the Damson plums are reliable bearers, though no other variety can be depended on. Of course, in some other locality all this would be different; hence my advice to the beginner to carefully study the peculiarities of his own location and market before commencing his orchard.

LOCATION OF THE ORCHARD.

A northern or eastern exposure is better than one to the south. Hilly land, unfitted for cultivation, often makes excellent land for fruit. The best land is a rolling clay, with good natural drainage; the worst, for most varieties of fruit, is a rich black loam or alluvial soil.

Of course, when possible, the orchard should be near the house, both for convenience of the family and protection of the fruit.

SELECTION OF TREES.

The first need in tree planting is to get healthy young trees, true to name. Be sure and buy of responsible men. I would as soon trust a "three-card-monte" man

as a fruit tree agent of whom I knew nothing. Thousands of dollars are paid out every year for worse than worthless stock, and at prices double what the best stock could have been purchased for from responsible men. And yet those who allow themselves to be thus swindled seem to be shrewd business men in other transactions.

After an experience of twenty-five years, during which time I have set out and fruited over a thousand trees, I can fully indorse the following advice, which I copy from the catalogue of an experienced nurseryman:

PLANT YOUNG TREES.

They cost less at the nursery, in freight charges, also in handling and planting.

They are surer to grow, having more and better roots in proportion to the size of their tops. Large trees lose in moving more of their fibrous roots.

Having less top and almost perfect roots, the small trees become established sooner, and grow vigorously at once.

Making most of their growth on the ground where they are to stand, the small trees soon become adapted to the soil and location, and the planter can train them to such shape as he desires.

If you give these young trees good care, you will not lose any time, but will get a handsomer and more valuable orchard.

We find that the most experienced and successful tree planters will not buy large trees, but invariably prefer one- and two-year old trees.

CHOICE OF VARIETIES.

I am indebted for the following list to my brother, B. H. Brown, who, as a nurseryman and fruit-grower, has made a careful study of the matter, and has tested every variety named, as well as many which he has discarded. This list is what he would recommend for family use; but the beginner must remember what has already been said about consulting the needs of his own locality.

Apples.—Early: Early Harvest, Benoni, Red Astrachan. Fall: Maiden Blush, Porter, Bellmont, Fall Wine, Fall Pippin, Jersey Sweet. Winter: Yellow Bellflower,

Baldwin, Smith Cider, Rambo, White Pippin, Wine Sap, Golden Russet, Ben Davis, Rome Beauty, Rawles Janette, Wagoner.

PEACHES.—Troth's Early, Early Amsden, Crawford's Early, Crawford's Late, Smock, Stump the World, Old Mixon, Switzerland, Oxford Late, Heath Cling, Salway.

PEARS.—Bartlett, Osband's Summer, Sheldon, Tyson, Seckle, Clapp's Favorite, Lawrence. Duchess, Bloodgood.

CHERRIES.—Early Richmond, May Duke, Early Purple Quigne, Bowman's May, Elton, Black Tartarian, and Governor Wood.

CURRANTS.—White Grape, Red Dutch, Versailes.

RASPBERRIES.—Black: Gregg, Mammoth Cluster. Red: Turner, Cuthbert.

STRAWBERRIES. — Cumberland Triumph, Sharpless, Crescent Seedling, Charles Downing, Kentucky.

BLACKBERRIES.—Lawton, Kittatinny, Snyder.

GRAPES.—Hartford Prolific, Concord, Martha, Lady, Catawba.

PLUMS.—Shropshire Damson.

QUINCE.—Orange.

The following list is for a large orchard, and gives the number of each variety recommended for an orchard of one thousand apple. Smith Cider 300, Wine Sap 200, Ben Davis 200, Rome Beauty 100, White Pippin 100, Rawles Janette 100.

Of one thousand peaches, set Switzerland 200, Old Mixon 150, Stump the World 150, Smock 150, Oxford Late 100, Ward's Late 50, Gudgeon's Late 50, Troth's Early 50, Salway 50, Heath Cling 50.

For one hundred pears, plant Bartlett 25, Duchess 20, Beurre Clairgean 15, Clapp's Favorite 10, Flemish Beauty 10, Seckle 5, Tyson 5.

For one hundred cherries, plant Early Richmond 50,

Elton 20, Black Tartarian 10, May Duke 10, Governor Wood 10.

DISTANCES IN PLANTING,

Apples may be planted thirty three feet apart each way; pears sixteen to twenty feet; peaches and plums sixteen feet; small varieties, of cherries, such as Early Richmond and Morello, sixteen feet; large heart cherries twenty feet; quinces twelve feet.

In all cases, where the width of planting is less than twenty feet, it is well to leave every fifth space twenty feet, so as to enable you to drive through with the wagon to haul in manure and haul out the fruit.

Where an apple orchard is to be planted, and you wish to grow peaches at the same time, the apples may be set thirty-three feet apart each way, and peaches set between, thus—the stars representing the apples and the x's the peaches:

* x * x * x * x *

x x x x x x x x x

* x * x * x * x *

x x x x x x x x x

* x * x * x * x *

This will give on an acre 120 peach trees and 40 apple trees, and by the time the apples spread so as to need the room, the peaches will be out of the way. In 1858 I set an orchard of four hundred trees in this way, and was very successful with both peaches and apples.

PLANTING, CULTURE AND PRUNING.

In planting, I dig a hole two spades deep, putting the top soil on one side and the subsoil on the other. The width must exceed the greatest spread of the roots. When ready to set the tree, cut down the sides of the hole so as to fill the bottom with fine and mellow top soil until there is enough to make the tree stand at the proper depth; then fill in the surface soil, which has been laid on one side of the hole for this purpose, carefully sifting it among the roots, so as to leave no cavities, and treading it down firmly. When all the surface soil has been put in, top out with the subsoil.

CULTIVATION.—For at least three years after planting, cultivate your trees as well as you do your corn. Thousands of young fruit trees are ruined every year for lack of cultivation. Do not allow your small grain or tall corn to grow among them, but plant beans, pumpkins, potatoes, or some small variety of sweet corn. Especially avoid small grain, but if you *must* plant wheat or oats in your young orchard, mulch heavily around the trees for at least four feet each way from the tree.

After the trees are grown, all orchards still need cultivation to some extent, excepting, perhaps, pears; and some of our most successful growers of this fruit think it is more likely to blight when the ground is cultivated than when kept in grass.

The apple orchard should be plowed once in every three or four years, but never deep enough to break large roots. Mulching with old straw or coarse manure may take the place of cultivation.

Quinces and pears I would keep cultivated every year as long as they are kept bearing, but cultivation should be shallow, and I would not attempt to grow any crop among them after the third year. If three inches of the

soil is stirred, and no weeds and grass allowed to grow, it is all that is necessary.

I think the cultivation can be done best with one horse and a single shovel plow first, and then across with one horse and a double shovel plow. Use a short single-tree and let the chains be wrapped with thick woolen rags. If the trees have branched out low, do not drive too closely to them; but after you have finished plowing, take a light mattock and loosen the soil left unplowed next the trees. It will not be difficult if done soon after a rain, when the ground is soft.

PRUNING.—This should be attended to while the trees are young. Always have a reason for every cut you make. Keep in mind that your object is to produce an open, symetrical top, well balanced and open to sun and air, with branches that will not chafe each other. The ideal for the underside of a fruit tree is an inverted umbrella.

In the latter part of this book will be found a convenient table, giving the number of trees or plants in an acre.

CHAPTER XVIII.

THE VEGETABLE GARDEN.

A well managed garden of a quarter of an acre can be made to produce each season what would cost in market a hundred dollars—and besides its money value, will be a great addition to the farmer's table, relieving it of monotony and adding to the health of his family.

In view of these facts, it is strange how many farms we see on which there is either no garden at all or else where the garden is badly located, badly arranged and badly cared for; often allowed to grow up to weeds after crops have been gathered till it becomes the worst spot on the farm on which to grow crops requiring clean culture.

Every farmer ought to have a garden, and to have one there are certain things absolutely necessary:

The soil must be warm and easily worked.

It must be rich.

It must be well drained.

It must be free from weeds.

And in addition to these it certainly ought to be convenient to the house.

If the soil is a heavy clay it will pay to draw sand and black loam on to it. If on the other hand you have to deal with a leachy sand the addition of clay will be a benefit.

If starting on a new spot, I would spread on a quarter acre ten loads of good manure in the fall and plow under

and add half as much more as a top dressing in the spring. After this, a light coating of manure should be given every year.

The garden spot must be well drained. In chapter six you will find described the influence of underdraining on land, and for the garden one of the most valuable points is that it enables us to work the soil earlier. In this, earliness is of paramount importance.

In addition to thorough underdraining, it is well in the fall to plow into beds twelve or sixteen feet wide and open the furrows so as to carry off all surface water. By attention to these two points you will have your garden ready for planting some weeks earlier in the spring.

To keep a garden free from weeds requires vigilance. Cultivate thoroughly. Stir the soil as soon after a rain as it is in fit condition, and destroy the weeds before they get above the surface. *Never allow a weed to go to seed*, and in a few years the labor of cultivation will be reduced one-half.

PROTECTION.—Drainage and fall plowing will assist you in getting the garden planted early, but something more is sometimes needed. The north and west winds of spring are often cold, and a protection on these two sides is a great advantage. Either a high tight board fence, or a thick evergreen hedge will accomplish the work, but if you do not care to be at the expense of a fence, or wait for a hedge to grow, a very good and cheap wind-break can be made with corn stalks. Set a row of posts, and three or four feet from the ground nail a cheap board on each side directly opposite each other. Then set large strong corn stalks between these boards, crowding them tightly between the space.

ARRANGEMENT AND CULTIVATION.

To economize space, and permit the use of the horse

or hand plow, plant everything in rows running the full length of the garden. If of any vegetable an entire row would give you too much, you can plant one half way and finish with something else.

With a garden laid out in this way, you can with a hand plow—of which there are a great variety in use—stir the whole quarter acre in an hour, while to hoe it would require the greater part of a day.

For the appearance, and also to enable you to get as close as possible to the rows with the plow, use a garden line and make your rows as straight as possible. With a narrow shovel on your plow you can mark out your rows easily and rapidly, and with the line as a guide can get them straight.

Planting and Rotation.—The planting season in the garden in this latitude begins in February or March and ends with early September. There are many plants which on a well-drained soil will bear a very low temperature without injury. I have often planted peas, beets, radishes, spinach, onions and lettuce in February, and had them do well though March was cold and blustering. Occasionally the beets and radishes will be killed, but I have known them to escape though the ground was frozen hard enough to bear up a wagon, and I have never known the others injured by cold though the mercury has stood at only eight above zero.

Vegetables ought to follow each other in rapid succession, and as soon as one is done with, another should take its place. Much of the garden may be made to produce more than one crop a season. For example: Cucumbers for pickles may follow peas, and turnips be sown among the cucumbers. I have grown these crops by the acre in this way and realized a full yield from each. Melons, either water or musk, may be grown on

the pea ground by leaving spaces for the hills, or starting them in pots and transplanting when the peas are past use. I usually grow Hubbard squashes on the early potato patch, and succeed better with them than when planted early. In beginning to dig the potatoes I take up hills where I want the squash hills to be and plant the squashes, and by the time the squash vines get fairly to running, the potatoes can all be dug.

Winter cabbage can follow the early beans, and late beans occupy the spot where the lettuce and spinach stood. On the onion bed you can grow radishes, and turnips can follow the sweet corn. Indeed, by a little planning nearly the whole garden spot can be made to grow more than one crop a year, and thus not only the ground be made to pay liberally, but by the constant cultivation secured the growth of weeds will be prevented. In order to keep the land thus fully occupied, and so give the weeds no chance it will be well if you have a vacant spot and nothing to plant, to drill it in sweet corn or even field corn to cut up and feed to the cows.

Keep the fruit garden separate from the vegetable garden, and in it set out currants, raspberries, rhubarb, grapes, etc. These have no place among the vegetables and if placed there will very likely be neglected and weeds be allowed to grow around them to seed the remainder of the garden.

The quarter of an acre of which I have spoken is sufficient for vegetables only. When possible, it is well to drain and fertilize an acre or more and thus have the fruit garden and truck patch adjoining the vegetables.

I would not plant in the fruit garden anything larger than a quince bush, and would have the rows of raspberries, currants, etc., eight feet apart, so as to allow of horse cultivation.

With a plat of this size, sweet potatoes, sweet corn, melons, cucumbers, squashes, and potatoes in quantity can be grown.

VARIETIES OF VEGETABLES.

These vary so much with locality and fancy that it would be folly to attempt to lay down any positive rule, but I will mention some which I have found superior.

PEAS.—For the earliest plant Tom Thumb, Blue Peter and McLean's Little Gem. The last is the best flavored but the others earlier and very good if cooked when young. They are all dwarfs, needing no supports. At the same time plant Champion of England. This is a tall variety and of the very best flavor.

This first planting, if made as soon as the land can be worked will, in my latitude, give the first picking from the 20th of May to 1st of June according to the season, and will furnish a succession for about a month. A second planting early in April, and a third two weeks later will keep up an unbroken succession.

Many persons prefer to bush tall peas. I do not, and get fair returns and they are grown in large quantities for market garden in the same way. They fall over when two or three feet high, and then turn up and grow two or three feet more and bear good crops. I find it cheaper to grow two hundred feet of row without bushing than one hundred with, and get more than a half crop.*

Dwarf varieties of peas may be planted in rows

*I think difference in climate must be taken into the count in this matter. I am quite confident that tall peas in the warm, moist climate of Southern Illinois would not produce any crop at all if grown as Mr. Brown recommends, but would simply mould and rot. Where a man takes a pride in the looks of his garden, I think he will bush all peas that need it, even in climates where they could be grown without. R. S. T.

eighteen inches apart. The tall peas, if not bushed, may be planted in double rows two feet apart, so as to support each other. When bushed the rows should be four feet apart.

Lettuce.—Plant Curled Silesia for the earliest, and some time in April plant Prize Head for summer use. This last named is the best I have ever grown.

Beets.—Early Egyptian for earliest, with Improved Blood Turnip for main crop. All beets do best with early planting.

Beans.—Black Wax for snaps, they are hardy, prolific tender, of excellent flavor, and perfectly stringless. They may be planted last of April or first of May, and every two weeks thereafter till the first of August, for a succession. The Small Lima—also called Sieva or Butter, are fully equal to the Large Lima in flavor, are easier to shell, three weeks earlier and twice as productive. Dreer's Improved Lima is large, and the best flavored I have ever seen, but I have found it a shy bearer and quite late. It is worthy a place in the garden notwithstanding these faults.

Tomato.—The finest I have ever grown is the Acme. It is perfect in form, of a beautiful glossy red, and ripens all over and through at the same time.

Sweet Corn.—I consider the Early Boynton the best extra early variety. It bears very close planting, and has two or more ears to the stalk. Stowell Evergreen has never been superceded for the main crop. It is very productive, of good flavor, and continues in good condition for several weeks.

Onions.—I prefer the Yellow Globe Danvers for the family garden. White Portugal is best for pickles. Onions can be grown from seed with larger yield and finer quality than from sets. By early planting and

thorough cultivation three or four bushels can be grown on a square rod. For very early onions, small bulbs may be planted in fall or as early in spring as the ground can be worked.*

*There is one point in garden management Mr. Brown has not mentioned—namely, the importance in planting of pressing the ground firmly down on the seed. A good roller will do this, or when planting small amounts in rows, the row may be walked on after covering, putting one foot exactly in front of the other. Of course the amount of pressure will vary with different soils, but where a garden is well drained, and cultivated and manured as it ought to be, the soil is apt to be very loose. I have found that where the soil was firmly pressed about the seed, that not only did the seed germinate in half the time, but the young plant was stronger and more vigorous.

R. S. T.

CHAPTER XIX.

STOCK ON THE FARM.

CHOICE OF STOCK.

In stocking the farm care and judgment must be used, as has been indicated, the character of the farm considered and stock selected that will be adapted to the farm and locality. Whether sheep, or hogs, or cattle shall be the principal stock must be determined in this manner. In some cases all three may be kept; in more instances it will be found profitable to make a specialty of some one, though perhaps a few of the others may be also kept.

For broken, hilly farms there is no stock so profitable as the Merino sheep. They can climb over the hillsides and gain a living for themselves and owner on land that the plow could not turn, and on which no reaper could gather a crop. Where a small number of sheep only are kept, and mutton rather than wool is the object, the larger breeds will be found more profitable.

On rich bottom or prairie land where corn can be largely grown some of the larger breeds of hogs, such as Poland-Chinas, Chester Whites, Jersey Reds, will give the best returns for the feed. On other farms where grazing is more followed than corn raising, some of the smaller, finer-boned breeds will do well.

In determining the breed of cattle, consider the end in view. If you desire to make a specialty of "gilt-edged" butter, keep Jerseys. If you desire quantity of milk,

the Ayrshires or a milking strain of Short-horns crossed on a native will meet your wants. For a "general purpose" animal, good for both milk and beef, the Holsteins are rapidly coming into favor. A cross of Short-horn on our native stock, also produces some of our most valuable "general purpose" stock.*

GRADES OR THOROUGHBREDS.—I would hardly advise the young farmer in stocking his farm to begin with thoroughbred stock, unless he intends to go into the business of raising and selling thoroughbreds for breeding purposes; and it is not everyone who can successfully do this. In raising for milk or the butcher, good grades are sometimes even more profitable than thoroughbreds.

But I would impress upon the young farmer the importance of using thoroughbred males and continually grading up his stock. It is claimed by many experienced farmers that the offspring of a thoroughbred Short-horn sire on a native cow will bring more money at three years old than a native will at four, and this makes a male Short-horn very valuable, as he can put his impress on a large amount of stock.

In grading up, keep in mind your end in view, and aim steadily at that in your selection of crosses, whether you desire increase in size, perfect form, weight of flesh, or milk. Remember that there is a constant danger of deterioration, which can only be avoided by care and

*It should be borne in mind that in the matter of milk there is almost as much difference in different families of the same breed, as in the different breeds. Some Short-horns are almost worthless as milkers, giving an inconsiderable amount and poor in quality; while on the other hand I have drank Short-horn milk that I could not tell from Jersey milk, as it equalled it both in richness and flavor. As a general rule, however, the animal best adapted for milk will be least adapted for producing beef, and vice versa. R. S. T.

vigilance, and that there is abundant encouragement for the careful breeder.

CARE OF STOCK.

If asked to give in one sentence full directions for the care of stock, I should say: *Make them comfortable.* This covers all. For an animal to be comfortable must be well fed, have an abundant supply of pure water, must have shade during the heat of summer and protection from the storms of winter; when stabled they must have good bedding and be kept clean.

WATER FOR STOCK.

A supply of good water is necessary, both for the comfort and health of stock. There are many farms on which there are no springs or permanent streams, and on which the supply from wells is either uncertain or difficult to raise on account of depth.

On such farms resort may be had to cisterns and ponds. A cistern may be located anywhere that is most convenient for watering the stock, and filled with surface water or the drainage of the soil. They should never be dug in a run, or where there is so much fall as to cause the soil to wash, as they will then be liable to be filled with mud. But in any place where there is sufficient fall to enable you to gather into them the water from an acre, there will be no trouble in keeping them filled.

I have two of these cisterns that have furnished me an unfailing supply for seven years. The first one I filled from the surface and allowed the water to run in when very muddy, but found it soon settled and became as clear as spring water.

But I have found it is unnecessary to use surface water. A few rods of ordinary draining tile can be laid, crossing the natural flow of the water diagonally, and entering the cistern at a sufficient depth to be safe from

frost. If the ground is very level, a couple of furrows may be turned, starting from the cistern and diverging in the form a letter Y, to turn the flow of the surface water over the tile.

By this arrangement any rain which makes the land too wet to plow, will fill the cistern, and the water being clear, it will not deposit mud. From such a cistern the water is easily pumped, as the depth is but small.

Do not dig over ten feet deep, as it is cheaper to make them long and shallow. A cistern ten feet deep and the same in diameter will hold about one hundred and fifty barrels, and one of mine of this size has but twice been dry in seven years, though the horses have been watered from it constantly, and in dry seasons several head of stock.

If a cistern of much greater capacity than this is needed, it is better to dig it oval, as it is difficult to turn an arch if the width much exceeds ten feet.

The cost of these cisterns will vary in different localities and soils. Mine cost me $30, but were expensive to dig, as I had to blast through rock half the depth. This, however, saved expense in walling.*

Ponds often are successful on tough clay soils. They should be located where there is but little fall, to avoid their being filled with wash. They should be dug long and narrow—the length being east and west. All the work of digging, except shaping the sides and ends, can be done with the plow and scraper.

As soon as the pond is made, a dense row of quick-growing trees should be set out on the south and west,

*There are some tough clay soils in which a cistern can be dug, the sides sloping somewhat, and the cement applied directly to the clay walls, saving the expense of bricks or stones entirely. In other soils the cistern must not only be walled, but the walls cemented to make them hold water. R. S. T.

so as to shade it thoroughly, and it should be securely fenced, the fence crossing the pond a few feet from the east end, so as to allow the cattle to drink. This end—which will need no shade—should be graded to a gentle slope and the bank be covered with broken stone or clean gravel, this protection extending into the pond as far as the cattle are allowed to go, that they cannot by their tramping make it muddy.*

Such a pond would last a lifetime, and furnish an abundant supply of good water; but no one of the points mentioned can be neglected. A pond exposed to the sun, and into which the cattle are allowed to wade and drop their dung, and hogs to wallow, becomes merely a cesspool of impurities, and will not furnish water fit for stock of any kind.

Bad water for stock causes disease among them, and often typhoid fever among those who drink their milk.

To secure an unfailing supply of good water is often an expensive matter, but costs far less than the trouble and loss in a single dry season, when the cattle have to be driven a mile or more for water, and sometimes suffer severely from neglect.

HOW TO MAKE CHEAP BEEF.

I have been led to give considerable attention to this matter from the fact that I for some years fed cattle at a loss, or very small profit, and have found that this has been the experience of many others. I think if a careful account was kept, a majority of those who attempt winter-feeding of cattle lose money, and not one in ten really makes a fair profit. There are several reasons for

*There are many soils in which it is not possible to make a pond hold water. In any case, where the farmer can afford it, a good well, with an unfailing supply, and a wind-pump, by which a reservoir can be kept constantly filled, is one of the greatest comforts ever placed on a farm. R. S. T.

this. For example, beginning to feed at the wrong season of the year, feeding too heavily at the start, feeding too long, irregular feeding, etc., etc. I am confident that I can give advice which if followed will result in a good profit in every case, unless accident or disease should occasion loss. I have been in correspondence for some years with a large cattle-feeder of Illinois, whose experience was the same as mine until he adopted the plan of spring and early summer feeding, since which his profits have been uniformly large. Spring is the season of growth with animals as well as plants. All the conditions are favorable; the weather is pleasant, the grass abundant and succulent; there are no flies to torment the cattle, and the water is pure and abundant. In addition, the long winter on dry feed has brought the animal into such a hygienic condition as to enable it to assimilate a large amount of food, and I believe that ordinarily cattle gain more in May and June than they do in all the rest of the summer, and this often means the year, for the majority of cattle go on to pasture in the spring lighter than they came off of it the preceding autumn. My Illinois friend claims—and my own experience confirms it—that cattle can be bought the first of March and marketed in June so as to get as great a gain and advantage in June as if they were fed from the time grass failed the previous fall. To get this great gain the cattle must be fed long enough before turning on pasture to begin to gain rapidly, and I recommend that light grain feeding be given through March and stronger feed in April. If you are feeding large cattle—such as will sell as shippers, and these will give the greatest profit—I would keep up the grain feed on pasture till they are sold; but if your cattle are two-year old steers, or heifers, or dry cows, in-

tended for a home market, the grain may be discontinued as soon as the pastures are good. There are several advantages in feeding cattle at this season of the year: First, if you buy the cattle they will ordinarily cost less the first of March than in the fall, for by this time they will weigh less, having got what the butchers call the "gross" out of them, and they will be in a better condition to begin to gain at once. I think cattle can usually be bought as low the first of March as in the autumn, for there are always farmers who try to winter more stock than they have feed for, and so must put them on the market; but even if a little more be paid it is really cheaper. Second, by beginning to feed at this season and having your cattle well started when turned on grass, they will be ready for market before grass-fed cattle, and when the demand is greatest of the entire year, and prices usually the highest. A few weeks at this season will often make a dollar a hundred difference in the price. Third, the pastures can be stocked fully twice as heavily if the cattle are to be sold in June as they could if they are to be kept on them all summer, for this is a season of the greatest growth for grass, and by this plan enough profit can be made from the pastures so that you can afford to let them rest the balance of the season, which will insure a growth sufficient to protect the roots and give you earlier pasture the next year. To show what has been done by this management, my Illinois friend reports that fifty fine steers fed from February 17th to June 22d, made an average gain of four hundred and nineteen pounds each one spring; and a net profit, after deducting what the corn was worth, of over $17 a head on sixty-four head another spring. I have fed only on a small scale, but have never failed to realize a handsome profit on cattle managed in this way.

HORSES AND MULES.

One question of considerable importance in making a start on the farm is, shall you use mules or horses for farm work? Twelve years' experience in their use leads me to heartily recommend mules for several reasons: First, they are much hardier than horses, especially enduring heat better; they are less liable to lameness or disease, and recover much quicker when anything is wrong with them. Second, as a rule, they are better pullers than horses and not so likely to be spoiled by a poor driver. Third, they are much easier kept and quite a saving can be made here, as they require but little grain when not at work. Fourth, they are much longer lived and will do several years more labor than horses.

I think it will pay the farmer well to raise his own mules and horses, for he can do it cheaper than he can buy really good stock, and a poor horse is dear at any price. There are many mules and colts raised every season from unsound mares, and although they may have a fair appearance when young, they break down soon under hard work. The farmer who keeps strong, healthy mares and selects good sires, can be sure of raising sound and valuable horses.

HOGS ON THE FARM.

My experience with hogs dates back some forty years, at which time hog cholera was unknown, and the locomotive powers of the brute were sufficient to carry him to a distant market. In 1847 I gained my first experience as a drover, helping drive three hundred and fifty hogs from Union county, Indiana, to Cincinnati, a distance of over fifty miles. We made the trip in a little

over five days, and but one hog gave out on the way. In December of the same year my father drove from Madison county, Indiana, to the same market, a distance of over one hundred miles. The hogs at that day were raised and wintered in the woods, and largely fattened by "hoggin' off the corn," as it was called, by which was meant turning them into the field and allowing them to help themselves. There was scarcely any effort made at that time to improve the breed of hogs, and it was hardly desirable to do so, for the chief qualifications wanted were hardiness and power to transport his carcass to market, and these they possessed. It would have been next to an impossibility to have improved the breed: first, for want of transportation, there being no way to ship improved stock without great trouble and expense; and second, because the woods were full of boars, many of them "elm peelers" several years old, who would jump over, root under, or bore through any fence ever invented.

At the time I speak of summer packing was unknown, and nearly all the business of the country was done on credit, and as there was very little market for grain, and then only when it was wagoned over bad roads to a distant city. The hog was the product of the farm that brought the only large amount of cash the farmer ever handled, and so the packing season ushered in an era of universal prosperity, for the farmer paid his bills, and the blacksmith and shoemaker were then able to pay theirs, the country merchant paid for his goods in Cincinnati, enabling the wholesale merchant to pay his New York bills; and so the dying squeal of the porker verified the words of the poet:

"From lowly woe springs lordly joy,
From humbler good diviner;
The greater life must aye destroy
And drink the minor."

I could tell stories of hog-driving that would read like a romance; but as this book deals with practical questions of to-day, I pass on to the question of

SUCCESSFUL HOG-RAISING.

First, the farm on which hogs are to be made the leading product, must be one well adapted to corn, and this crop will not thrive on cold, wet land, and the growing of it will ruin a rolling, washy soil. Our best corn lands are, almost without exception, good for wheat, and I would recommend a four-years rotation on a hog farm—two years corn, one year wheat, and one year clover. This would give a clover field on which to pasture hogs in summer and to feed them in the fall, and this management would keep up the fertility of the soil. It is not my purpose to recommend any one breed of hogs above all others, neither to enumerate the multiplied breeds now to be found in this country. Probably nine-tenths of our Western farmers will breed Poland-China, Berkshire, or some of their crosses; and either of these breeds is good, and many practical farmers of large experience consider a cross of the two—using a Berkshire male—as the best and most profitable butcher hog in existence. I have tried both breeds pure, and their crosses for several years, and if I were on a corn farm and making hogs my leading interest, I should always use Poland-China sows for breeders, but should, when pork was what I wanted, cross with the Berkshire, but would breed my best sows to a Poland-China boar, to raise brood sows. My reasons for this are that the Berkshire hog is more active, less likely to break down in transportation to market, and certainly not inferior in constitution to the Poland-China. The cross which I recommend gives good size, hardiness, early maturity, and, indeed, about all the desirable qualities of both

breeds. I live in the county where the Poland-China hog originated, and an average of more than one thousand pigs of this breed are shipped for breeding purposes from my station every year, so I have been familiar with the breed from its origin. Some years ago I examined the Assessor's returns in every county in Ohio, with a view of ascertaining if the hogs in Butler and Warren counties—where nearly all are either pure or high grade Poland-Chinas—were valued higher per head than in other parts of the State. I found that in but one county of the State was the valuation as high, and that was Lake county, where very few hogs were kept, and fed largely I presume on milk and small potatoes, as dairying and potato-growing are the leading interests of that county. The value per head in the two counties named was more than three times as great as in some counties where no attempts had been made to improve the hogs. The same year I found that the hogs packed in Cincinnati—which were largely Poland-China—averaged sixty pounds per head above those packed at Chicago. Looking upon the hog as a machine for manufacturing a less bulky and more valuable article out of corn, thus saving expenses of transportation, I should name the following points as desirable: First, constitution; second, power to assimilate food; third, early maturity. Keeping in mind these points, and taking it for granted that the farmer has good stock, I will begin with

THE SOW AND HER PIGS.

And first, I would recommend mature mothers. I have little doubt that one of the causes of disease so prevalent among swine is, that the constitution was impaired by the almost universal custom which prevailed for many years, of breeding sows at eight months old. There are many points in favor of mature mothers: They are bet-

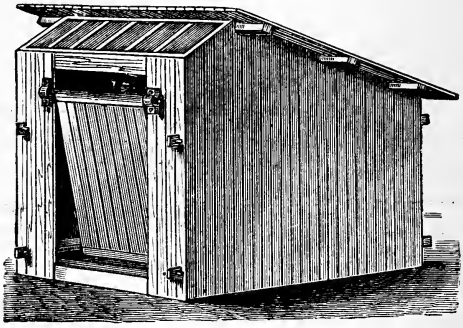
ter milkers, and consequently give the pigs a better and quicker start. They bring forth stronger pigs, and are able to suckle larger litters than young sows. They are much more certain to save their pigs, especially when bred for early spring farrowing. In my own experience for twenty-five years past, during which time I have bred hundreds of sows, I estimate the loss of pigs at farrowing time from young sows, at three to one when I have bred from mature sows.

There is another point in favor of allowing the sow to mature before subjecting her to the tax of maternity, which is that she will develop much better. I have taken two sows from the same litter that I could detect no difference in, and bred one to come in at a year old, and kept the other over till the next season without breeding, and found the latter one hundred and fifty pounds the heaviest, and of much the finest form.

When young sows are to be bred I would not couple before January, so that settled, warm weather might be expected before the pigs come, and the sows could get some green food. In fact, if the pigs are to be wintered and not fattened until eighteen or twenty months old, I think it best to breed all sows at this date, as the risk of loss is much less than with March pigs. If the farmer is raising pigs to sell for breeders, or intends to fatten at from eight to ten months old, it will pay to take the risk of having them come in March. When bred always make a record of it, and it is well to enter at the same time the date at which the litter is expected. The period of gestation in swine is one hundred and twelve days, and I have never known them to exceed this more than three or four days, and rarely to fall much below it; but as there are cases on record where young sows have farrowed in from one hundred to one

hundred and six days, I would advise that the sows be separated and put where you want them to farrow two weeks ahead of date. I would make the entry in this way: "Spotted sow, Bess, bred Jan. 9th; look for pigs May 1st."

I think the practice of allowing the boar to run with the herd an abominable one, as he will fret and worry, and is likely to become unmanageable. Keep him in a strong, close pen, and turn the sow to him, and as soon as served remove her.

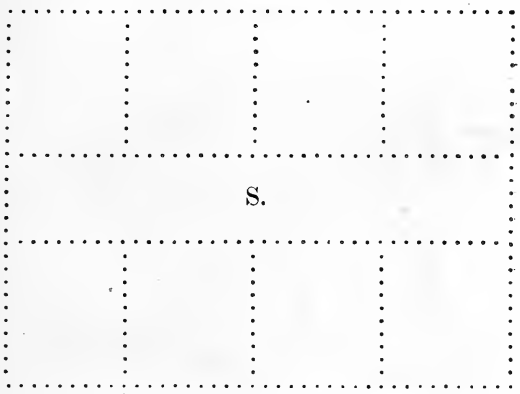


PORTABLE HOG-PEN.

This portable pen, if for large sows, should be made six by seven feet. The short slope of roof in front is intended for glass when it is used for early pigs. The pen is the invention of Mr. L. N. Bonham, of Oxford, Ohio, who kindly loaned us the cut. We have used these pens on our own farm, and are much pleased with them. By nailing a board across at each end, allowing it to project far enough for a handle—which should be rounded off like the boards of a gravel-bed—four men can easily carry one of these pens, or it may be loaded on a low sled when you wish to move it far.

On farms where hogs are the leading product and

March pigs are desired, I believe it to be practicable to arrange a breeding house with a stove, and that in the long run it would pay. I saw some years since, on the farm of Mr. Wm. Greer, an old tenant house divided up into pens to accommodate a number of sows, and was assured by him that the plan worked satisfactorily. A house sixteen by twenty feet could be arranged thus: Make four pens five by six



feet in size, on each side of a hall four feet wide. The stove should stand in the center, and there would be room for a swill barrel and a few barrels or sacks of meal. I would make the ceiling low, so as to economize heat, and the loft could be used for corn. I would arrange in each of these compartments a guard—such as is described in the chapter on Buildings—to prevent the sow from overlaying the pigs. Make the floor of the building rather low, and have a door large enough for the sow to enter, open from the outside to each separate pen. When the sows are to farrow later, or when these have been turned out on pasture after the pigs are large enough to follow the sow, I prefer the portable pen. I

do not believe in hot-house treatment of pigs, and it is not probable that any litter of March pigs would need fire for more than three or four days, often less; but young pigs are very delicate at first and easily chilled, and where valuable sows are kept this arrangement might be profitable, especially as the partitions could all be made movable, and the building used for other purposes eleven months of the year.

As few farmers will find it profitable to use fire, the next best thing is to make the pen as warm as possible without it, and for this purpose corn fodder is excellent. A single crack, half an inch wide, on the windward side of a hog-house in a blasting March day, may admit enough cold to chill to death a pig just born, but by setting a few bundles of corn fodder against the outside, and securing them in place by putting some rails against them, every breath of wind can be kept out.

Next to neglect in providing a suitable place for the sow to bring forth her young, injudicious feeding is the greatest cause of loss. The sow will be shut up where she cannot exercise, perhaps two or three weeks before farrowing, and fed on dry corn, and when she brings forth, the same heavy feed is continued. The result often is that fever ensues, the sow loses her appetite, her milk dries up and the pigs starve to death. Again, the want of exercise and the dry, rich food causes constipation, and the sow becomes ravenous and eats up her litter. From the day the sow is shut up give a varied diet: wheat bran, potatoes or some other roots, charcoal, rotten wood, and grass if possible, or bright clover hay, or corn fodder, and for some days after farrowing, feed *lightly and very little corn.* I wish to emphasize this last sentence.

Young pigs need exercise, and thousands die every

year before they are a month old from being kept in close pens. They get too fat and begin to wheeze or cough, and take the thumps and die. The sow should, if possible, be turned out in a pasture lot and the pigs allowed to follow her by the time they are two weeks old. The secret of a profitable hog is to keep it thrifty and growing from the start, and as soon as you notice the pigs begin to eat corn, provide a pen which the mother cannot enter, and feed soaked corn and slop to them, taking pains to feed only what they will eat clean. If you wish to breed the sows for a second litter, you will be able to wean the pigs much younger for thus teaching them to eat early. It is quite an expense to keep a large sow a year, and we have found it profitable to breed twice a year. With proper care, there is no trouble in keeping fall pigs thrifty and growing all winter, and they may be marketed in spring for pig pork, or pastured and fattened in the fall. September pigs well cared for will give as much profit as spring pigs, and can be in good condition for market and should weigh two hundred pounds by the May following.

One great cause of unthrifty hogs, and a potent cause of the diseases which have caused such losses to hog-breeders, is the continual feeding of a concentrated, heating, fat-producing diet; and to keep a hog in health he requires some bulky food. This fact is what makes clover so valuable to the pork-producer, for clover is worth much more than the weight of pork it will produce, for a hog that has pastured on it through the summer has built up bone and muscle and had his stomach distended, and the system thoroughly prepared for assimilating food, and a very rapid gain when corn-feeding begins. Pasture and green food are of such importance that we would recommend a rye field for early pasturing, unless

you have early blue grass, and an abundant supply of pumpkins for fall feeding, and have no doubt that the risk of loss by disease would be lessened and the cost of pork reduced a cent or more a pound by this management. Experiments in the use of clover were made by the editor of the *Live Stock Journal* with the following result: A litter of six pigs were taken at weaning time and divided into two lots. One was fed on corn-meal and water alone, all they would eat; the other lot on the same mixed with clover cut fine. The lot whose feed was mixed with clover kept a good appetite all the time, while the other lot were frequently "off their feed." At the end of five months those fed on meal alone weighed one hundred and fifty pounds each, and those fed on meal and clover two hundred and ten pounds each. To further test the matter, the same gentleman put up in winter two lots of hogs averaging one hundred and fifty pounds each, and fed corn-meal slop to one lot, and the same mixed with cut clover hay to the other. The experiment continued one hundred and twenty days, when the lot fed on meal were found to have gained one hundred and ten pounds each, and the other lot one hundred and forty-three pounds each.

In pasturing clover, it is best not to turn on it until it begins to blossom, for we want a full development of the plant, both for the benefit of the stock and the land. The roots of the clover can never reach down into the subsoil if the top is not allowed to develop. We advise that fattening begin early. Numberless experiments have settled the question that a given amount of food will make double the amount of gain in the mild, pleasant weather of autumn than it will amid the cold and snow of December. If, as we recommend, you feed on a clover sod, the cattle must be kept out, particularly if

you feed cut up corn at first. We have known cattle killed by eating the cuds of husk which the hogs drop after chewing. We would, during the first few weeks of feeding, try to get the hogs to eat all the bulky food possible, and this will be easy if you do not give too much corn. Keep a supply of salt, and ashes, or charcoal where they can have access to it at all times. Feed on a new spot every day, so as to enrich as much of the field as possible. The best crib to feed from is an old wagon, and one which will last for years can often be bought at a sale for a few dollars.

Many experiments have been made to ascertain how much pork can be made from a bushel of corn. We have before us the results of several of these experiments, showing from nine and three-fourths to twelve pounds. One large lot, fed for forty-three days, made an average of ten pounds for each bushel of corn, and we are inclined to believe that it will require good hogs and good weather and the best of care to give this result. Without all these points the average will be much less.

An important question is whether to fatten at nine or ten months old. The farmer must determine for himself which plan to adopt. We believe that cheaper pork can be made from the young hog. The risk of disease is of course much reduced, and there is a quicker return for the capital invested. It is easy, with good stock, to make an average weight of two hundred and fifty pounds at nine months, and the same hogs, if kept ten or twelve months longer, would probably not weigh over four hundred pounds. Where pigs are to be fattened at this age, we would recommend that they be allowed to run on grass and fed enough to keep them gaining rapidly till seven months old, and then shut up and fed all they will eat till ready for market.

WINTERING HOGS.

There are a few simple rules in wintering hogs, the observance or neglect of which will make all the difference between a thrifty hog that will gain regularly all winter, and a stunted, enfeebled one that will fall an easy prey to disease. These rules are: First, not too many hogs together. Second, each lot to be composed of hogs as nearly the same size as possible. Third, a dry, warm, clean bed. Fourth, some variety in diet, and for fall pigs warm drink. We have often seen on a farm forty or fifty hogs of all sizes, including half dozen sows two or three years old, twenty or thirty spring pigs, and a dozen or more fall pigs. On a sharp, frosty morning, when called up to be fed, these small pigs will come out steaming as though just out of a warm bath, and are almost sure to take cold; besides, they are fought and driven off so that they cannot get half their share of food, and if they live through the winter at all—which is doubtful—they will gain little if any in weight. We like corn fodder for a bed for hogs much better than straw, and find that they eat all the blades, thus supplying themselves with the bulky food needed.

When cattle are fed for beef during the winter, and there are stock hogs to follow them, we would advise heavy feeding of the cattle with whole corn, as the hogs will eat all that passes the cattle undigested, and thrive well on it.

COOKING FOOD FOR HOGS.

Will it pay to cook feed for hogs? is a question often asked, and often answered in the negative at a heavy expense for apparatus bought. I advocated it ardently when a much younger man than I am now, and can show stowed away as useless lumber, several double, back-action patent steamers and cookers. I can say emphati-

cally that *I* never could make it pay. Besides, I know of scores of farmers who began cooking feed for their hogs with great enthusiasm, and yet I do not know of one of them who has kept it up more than a year or two at the farthest. I do not deny that cooked food is better than raw, but I am sure that it is not enough better to pay for the trouble and expense with the amount of hogs kept on the ordinary farm. Further, we say that ground food is worth just as much soured as cooked, and there is very little trouble or expense to do this at any season of the year. In the summer you must guard against excessive acidty, and in the winter against freezing; and for either you will need two barrels. A swill barrel in summer that stands for days without emptying, often becomes as sour as vinegar, but by having two barrels, and emptying one every other day, the excess of acidity can be avoided. In the winter, fermentation is slower, and two barrels are needed, so as to give more time. For winter, the barrels must be packed in dry sawdust to prevent freezing, and if not under a roof, there should be a sloping lid, hung with a hinge, to close so as to keep the sawdust dry. Have the box eight inches wider every way than the barrel. If forty-gallon barrels are used, the box will need to be about five and a half by three and a half feet, and will take, without a lid, about fifty feet of lumber. Set the barrels in the box quite close to each other, and fill around them with dry sawdust, cover the top with two thicknesses of old carpet, and pour into each a tea-kettleful of boiling water each day, and the winter must be severe if any ice forms. Let one barrel sour while you are using from the other, and you need never be wanting warm slop, equal in every respect to that which is cooked.

There is an opinion prevalent that corn and hog pro-

duction is exhaustive to the soil. If the rotation and plan of feeding recommended in this chapter is followed it certainly is not. The hog is also a valuable manure-maker if rightly managed. A half score of active young hogs in such a hog-house as is illustrated in the chapter on farm buildings, if furnished in the outside floored pen with all the straw they will work up, will half pay for their feed in manure; and when there is an old straw stack or a few tons of corn butts to be worked over into manure, a hog will more than pay for his food.

DISEASES OF HOGS.

I wish I could offer an infallible preventive, or a specific remedy for the epidemic diseases which have occasioned such loss to the farmers of the West. Experience proves, however, that with the best of care and under the most careful sanitary regulations, it will occasionally break out in so malignant a form as to almost annihilate the hogs of a farm or neighborhood. I have never lost a hog from epidemic disease, and a few years ago prided myself that my own good management was the cause of my exemption. I have seen, however, on the farms of neighbors, where fine breeding stock was kept, and far better sanitary precautions enforced than on my own, entire herds carried off in a few days. In one case this could be traced to the infection being brought by hogs from a neighboring farm that were running at large, contrary to law. The law against stock running at large ought to be rigidly enforced against hogs, and if this is done, one source of danger will be avoided. One cannot too carefully attend to all the points which will help keep his hogs healthy, and if this is done the risk of loss will be greatly reduced.

DAIRYING.

In many localities, and especially where a large proportion of the land is unsuited to grain, dairying is an important interest. It has also this advantage; that it does not, like grain croping, exhaust the soil, and it gives a regular cash income. It comes in well in a system of mixed farming, as the cows will consume the corn fodder, hay and straw, and furnish manure to apply to the wheat fields. Doubtless the most profitable disposition of dairy products is te sell the milk to consumers by the quart, but as few farmers can own a milk route I shall not speak of this further. The least troublesome way is to sell to the factories, but there are large sections where there are no factories. What I shall say in this chapter, therefore, will apply more directly to the farm dairy where the profits are to come from butter, and my own experience has been with a dairy of this kind. I wish to say in the beginning that there can be nothing made from a butter dairy if a common article is made and sold at the usual market price; and unless sure you can make an extra good article, and you can get a yearly contract for it at a remunerative price, you would better let the calves run with your cows and save expense and labor.

SELECTION OF DAIRY STOCK.

From my own experience in buying cows I would advise that you buy thrifty young cows that can be had at a moderate price, rather than to attempt to buy cows that are highly recommended and for which fancy prices are asked. Buy your cows largely with reference to getting your money back in beef, if they prove poor milkers or unprofitable for butter; and then if they do not suit you, keep them but a single season. I know this is

contrary to the advice usually given, but as I look back over my own experience, I have rarely bought a cow at a high price that has given satisfaction. If up to the standard for milk or butter, she often had some little accomplishment which her owner forgot to mention, such as an ugly temper, a supreme indifference to fences, or a too free use of her horns; and often she failed in the first named qualities. During the time I ran a butter dairy, out of some forty cows that I bought, the best two and the only ones I kept when I quit making butter for sale, cost me $30.00 each. I bought among this number several cows, the owners of which gave them a great reputation, paying fifty dollars and upward for them; but I failed to make the transaction profitable in any instance. I see by looking at my account book, that in the summer of 1877 I sold for $156.00 four cows, which I had milked all summer, and for $122.00 replaced them with as many that were fresh. I do not wish to be understood as recommending the keeping of poor or ordinary cows, for the difference in the cost of keeping a cow that will make seven pounds of butter a week for the best six months of the year, and one that will make but four, is small; but at thirty cents a pound there would be over twenty-three dollars in favor of the best cow. I do believe, however, that it will be cheaper and more satisfactory to buy good average cows at moderate prices, hold on to the extra good ones and dispose of the others and try again, than to pay extravagant prices, and then often be disappointed. I should advise that you breed to a male of a good milking family and raise the heifer calves, and your efforts should be continually to grade up and improve your stock.

HOW TO MAKE GOOD BUTTER.

I have said there is no profit in a common or poor arti-

cle of butter. Three things are necessary to make a first class article. Good food, cleanliness, and a suitable and uniform temperature for the milk. Taking these up in the order named, I recommend mixed grasses for pasture, and the more varieties the better. If you can have blue grass, orchard grass, timothy, red top, and red and white clover in the pasture, it will be better than any one or two of them. As we are subject to drought and consequent short pastures, the dairyman should always grow some soiling crops to use when needed, and Stowell or mammoth sweet corn is perhaps the best, although Blount's prolific will yield more feed to the acre, and common field corn will answer for winter. I have found nothing to equal bran and corn meal mixed, weight for weight, which will give about two bulks of bran to one of corn meal.

I like in connection with this to feed a little whole corn, as the cows are exceedingly fond of it and it gives variety. For rough feed I find bright corn-fodder excellent, and cheaper than any other; and I always feed it as long as it lasts, which, with me, is usually all winter. Clover hay, if bright and sweet, is perhaps better, but not so cheap. I see by reference to my account book, that when I was milking eight cows in winter, I fed per week, three hundred and fifty pounds of the bran and meal mixed, three bushels of small corn, and a half ton of fodder, which was from corn cut up at the ground, and was one third waste. This made, calling the corn fifty-six pounds to the bushel, a daily ration of twenty-one pounds for each cow; and as corn at that time was 25 cents a bushel, and bran $9 a ton, and the fodder did not cost more than $3 a ton; so the gross cost of keeping my cows was small. The corn and bran averaged just nine pounds to a cow, per day, costing, allowing a

little for draying the corn to and from the mill, 5 cents a day for each cow, while the cost of fodder was a little less than 3 cents a day per head. I have found by repeated experiments that this ration, nine pounds of meal and grain, and twelve net of corn fodder or good clover hay, is a full ration for an averaged sized cow, and will keep up a full flow of milk or fatten her if dry. Every dairy-man should lay in his stock of bran in the summer. I have never failed to buy at the lowest figures in July or August. The demand is less then and the Millers want to clean their bins so as to be ready for the new crop of wheat, and there can be enough saved in buying then to justify borrowing money at a high per cent., if necessary.

The second point in making good butter, "cleanliness," needs no argument. It must begin in the stable and include the milker and all the vessels used about the milk, and its surroundings.

The third point, "temperature," is as important as any, for good butter cannot be made in hot weather without this can be controlled. There are two ways; one by an unlimited supply of cold spring or well water, and the other by ice. I should always prefer the former if it could be had. Whichever way the milk is to be cooled, I advise deep setting. I have practised it for six years, and could not be induced to go back to the old plan of shallow jars. I use cans eight inches in diameter and twenty inches deep. If we cool with water we sink to the top in a box through which water from a spring flows, or if it must be pumped, we arrange it so as to draw off the water when the milk is partially cooled, and then pump a fresh supply. For ice, use a large chest with side doors to slide in the cans, and a slatted floor above on which to lay the ice, through a door in

the top. This upper space should be over a foot deep, so that there will be room to set meat, butter, etc. on the cakes of ice. In the hottest weather you will need to set a cake of ice on edge between the cans below as well as to have it melting and dripping over the cans from above. Managed in this way I have marketed as solid, fragrant butter in dog-days as in May or October. My first knowledge of the plan of deep setting of milk was gained from a dairy-man at Elgin, Illinois, who kept sixty cows, and sold the milk to a factory which did not take the Sunday milking. By putting this milk in deep cans and sinking it in a spring, he kept it sweet all the week, and raised his calves on it. Two articles not usually found in the dairy I would recommend; a test glass and milking tubes. The first is a glass arranged with a graduated scale, so that by filling it to the top and setting it away for the cream to raise, you can tell exactly the per cent. of cream. The milking tubes I would not use except in case of sore teats or an accident of some kind. A cow will sometimes get a teat cut or badly scratched with briars, so that every time you milk the sore will be opened, and it is almost impossible to heal it. By the use of the tubes you can draw off the milk and the teat soon gets well. I always keep in my stable something to use on the teats at the first sign of cracking. Glycerine is good, and I have recommended it for many years; but I have recently used vaseline and find it much better. I believe that if a little of this is applied at the first appearance of roughness, that it will be found a certain preventative, and as there are many cows that suffer both spring and fall, for weeks, with cracked teats so that it is almost impossible to milk them, this remedy should be generally known. Although not connected with dairying, I will say here

that I have found Neatsfoot oil as useful in the horse stable as vaseline for cows. If the collars are kept clean and a little of this oil rubbed on them every day, and at the first appearance of galling it is applied to the shoulders or sides of the horses, I think that they will never be disabled from this cause.

The arrangement of the cow stable is of great importance to the dairy-man. First of all it should be so arranged that you can keep the cows clean, and I have never seen this done except where there was a manure ditch. The floor on which the cows stand should be not more than five and a half feet long; considerably less if the cows are confined in stanchions. The manure ditch should be eight inches deep and not more than thirty inches wide, for you want it so that you can easily step across it. You can keep the cows as clean, easily, by having the floor on which they stand raised eight or ten inches, but the manure will be scattered and the urine flow back, so that you are almost certain to soil your boots if managed in this way; but with the manure ditch you always know where to step, and will rarely carry the odor of the stable away with you.

This manure ditch should be made water tight, and I would advise that the sides be made of two inch oak plank not less than a foot wide; fill the bottom with tough clay, pounded in, or if you cannot get clay suitable, use coarse gravel and then a coat of cement; but on top of the clay or cement lay a floor of good inch boards.

I have never found any bedding that suited me as well as sawdust; it keeps the cows clean and takes up the liquid better than any other material. I do not make stalls in the cow stable but allow each cow four feet of space, which I find ample, and make a short par-

tition to keep them from trying to get eacn others feed. Two feet is as far back as it need extend, and then it is not in the way in milking. I have tried several kinds of ties, and prefer the ring and snap to all others. By this I mean that we tie a strong piece of rope around each cows horns, with a ring on the rope, and leave it there permanently. We then have a short rope, not over two feet, tied securely in front, with a strong snap on it. The manger is wide enough so that we walk through it in front of the cows in tying or untying them, and it is the work of a moment to fasten or loosen a long row of cattle. If I was keeping a large dairy I would arrange the stable so that I could drive through with a wagon to remove the manure, having the manure ditches far enough apart to let the wagon between them; but where a few cows are kept it can be wheeled out.

An important factor in the profits of the butter dairy is the skim-milk, and how to make the most from it. If the farmer is raising thoroughbred pigs to sell for breeders, I think he will find it more profitable to feed it to them, as no other food gives so good a start or makes such showy pigs; but by judicious management as good calves can be raised on skim-milk as by letting them suck the cow. To do this it will be necessary to add to the milk enough oil meal or flaxseed to make up the loss of the cream. Caution should be exercised in changing from new to skim-milk, for the calf should always be fed on new milk for a few days, or until you can see it begin to grow. Begin by adding to the milk a tablespoonful of the seed, steeped in hot water, or double the amount of the meal, and increase gradually. At five weeks old begin to feed the calf shelled corn, and as soon as it will eat a half pint at a feed you can decrease the flaxseed or meal. If you feed regularly you can make the calf fit

for veal in this way and grow a healthy, well developed animal.

I have often found it more profitable to milk a cow for two, and sometimes even three years, without breeding. There are many cows that will, if well fed and kept from breeding, give a profitable flow of milk for a long time, and the milk will be richer the second year after calving than it was the first. This is an important fact to the man who keeps but one cow, as if bred every year she must go dry several weeks.

As the proof of the value of a good cow I will close this chapter with a statement of an account which a friend of mine kept with his cows for nine years.. But one cow was kept at a time but he bought and sold so that several different cows are included in the account. The cow was charged $2.50 per month for pasture, and market price for hay, bran and meal consumed. She was credited with milk and butter sold and the market price for milk and butter consumed in the family, the same as if it had been sold. The account kept with this cow for one year is as follows:

Cow.	Dr,
Six months pasture at $2.50 per month,	$15.00.
Hay, bran, etc.,	30.00.
Total,	$45.00.
	Cr.
Milk sold,	$20.00.
Butter sold and used,	48.00.
Four quarts of milk used per day,	55.00.
Total,	$123.00.
Deduct cost of keeping,	45.00.
Leaves profit,	$78.00.

Three years out of the nine the cow yielded a profit of over $100 after paying for her keeping. It is perhaps needless to add that the cow was well fed and cared for in every respect.

In 1878 I milked eight cows and sold the butter at 28 cents, and my account with the cows stands as follows:

Account with dairy.	Cr.
778 pounds of butter sold,	$217.84.
One calf sold,	7.80.
Milk sold,	10.00.
Three calves raised,	59.00.
Profit on cows sold,	16.00.
Total,	$301.64.

In addition to what was sold a family of nine persons were supplied with milk, butter and cream, and this, with what milk was fed to the pigs would, I think, pay for the pasturing of the cows. During the winter they consumed about six tons of bran and meal, seventy-five bushels of corn, and twelve tons of corn-fodder; and as the bran cost about $9 per ton and the corn but 25 cents per bushel and fodder but $3 per ton, it will be seen that I had a fair profit. If, however, the prices of food had been doubled, as they sometimes are, I should have made but a small profit at the price received.

To make a butter dairy profitable will require careful attention to all the details, and it will not do to trust too much to hired help.

SHEEP FARMING.

Waldo F. Brown, Sir:—You wish me to write a brief article on Sheep, in such fashion that it shall be the "best guide to success." I know no better way than to

give my own methods, which are based on long experience.

STEPHEN POWERS.

SOILS AND BREEDS.

All sheep do best on a dry, limestone soil; but they will do well on any soil, provided it is dry. The Merino loves the high hills, and is less tolerant of moisture than the English long-wools. But for any breed of sheep, if the soil is not dry, it should be made so, or else put to other uses, for it is a losing business to attempt to breed sheep on low, damp ground. Every breed of sheep does well in every climate within the temperate zone, provided the process of acclimation is conducted slowly. The Merino does equally well in the rigorous winter of Vermont and under the torrid sun of the Darling Downs of Australia. The Chiviots of Scotland could doubtless be transported to Brazil and flourish; but the removal might have to be made by so many short steps as to occupy a century.

The American Merino, for a general-purpose sheep, probably stands without a peer. The idea that the average full-grown sheep of any one of the improved breeds yields better mutton than the average full-grown sheep of any other, is fallacious. The special superiority of the British long-wools as mutton-producers, is this: They do not yield better mutton than the Merino at the *same age*, but they bring it into market so much earlier. The young of all animals whose flesh is used for food, are esteemed by the *gourmets* of great cities far above those of more mature age. A Cotswold or an Improved Kentucky will rear a lamb weighing seventy-five or a hundred pounds inside of six months, and the flesh of that lamb is worth in the city twice or thrice as much per

pound as the flesh of a yearling, because of its tender age. It is no better eating than the Merino lamb, but is more profitable near a great city, simply because of its precocity. The remarks in this paper refer to the American Merino, but they will be equally applicable to the English long-wools by observing the following rule: Whenever the number of sheep in a flock is given, divide by two, wherever the ration per head is given, multiply two.

CHOICE OF BREEDERS.

A well wooled ram may be a poor stock-getter. The latter quality will have to be determined by trial. A quality especially desirable is pre-potency, that is, the power to mark his progeny strongly after himself. In selecting a ram whose stock-getting qualities are unknown, the purchaser should observe the following points: A keen, bright, prominent eye; bright pink skin; thick spermatic cords; arched nose, deeply furrowed below the eyes, short, broad head; short, thick, heavy neck; broad, deep chest; broad on top of the withers; straight, strong, wide back; broad loin and rump; thick between stifle joints, large, round barrel, ribs well sprung out; well down in the flanks; short, straight legs, well spread apart, straight from the rump to the ground; profusely covered from a point two inches below the eyes to the hoofs with a long, dense fleece of buff-colored wool, finely crimped to the end of the fiber and free from gare, (hair), on the neck and hips, of a dark color on the outside which will not bleach in the storms; growing three inches long in a year; cheek, leg and belly wool (especially the latter) to be of good length and dense; scrotum well covered; wool around the eyes not obstructing the sight; plenty of smallish folds on the neck, some on the body and across the stifles, one low down on each

flank, and one shaped like a horseshoe on the rump, the heavier here the better. Most of the above points should be sought for in the ewe; but for a good breeder, she should be especially heavy in the hind-quarters. The "ewe-neck," with the droop just in front of the withers, is to be avoided; it indicates lack of constitution. The first, second, and third points in a good sheep are—constitution.

BREEDING.

In determining the time of lambing, the owner must consider the size of his flock, the quality and amount of spring feed, etc. A small flock well housed, well fed on bran, roots, clover hay and fodder, and thoroughly looked after, may be lambed to advantage in March, or even earlier. It is imperative that the ewes should have daily as much exercise as they would get in walking, say, two miles, constant access to salt, clear water at least once a day, and enough of the above feed to make a generous flow of milk. If these cannot be guaranteed, lambing had better be deferred until grass grows. A ewe fed on hay and corn may be fat and yean a large lamb, yet have no milk, and consequently disown it; and then a year's work is lost. Milk must be had at all costs. Never lamb on green rye, but when the lamb is a week old, the ewe may be turned on it with advantage, if other green feed is scarce. Of all cultivated grasses, I like orchard grass best for sheep-pasture; it grows so early in the spring and so late in the fall. Not over 150 ewes should be kept in a flock, and each should have at least ten square feet in the shed, with access to a yard or lot by day. As long as grass remains dead in the winter, they may run on it with considerable freedom; but as soon as it sprouts in the spring they should not be allowed to graze on it at all until about a week before such time as

it will do to turn them out altogether. First let them out a half hour a day, then an hour, and so on. Continue the feed of grain until the grass gets heart. One hundred ewes should have, during lambing, a bushel of "shipstuff" or two bushels of bran; feed in flat-bottomed troughs to prevent "hogging."

During lambing look over the flock every hour. If a ewe goes apart and remains alone but does not bring forth, examine her; thrust in the hand carefully, to ascertain if there is not constriction or growing-up of the uterus—a complaint to which the Merino ewe is liable. Take nothing for granted respecting a young lamb until you actually see him suck and know that he gets his milk. But be careful not to interfere with a young ewe until you are certain that she needs help, or has abandoned her lamb. If she has disowned it put her up with it in a small pen and whip her occasionally; I have known a ewe to stand out a month, and yet own it at last.

MANAGEMENT OF LAMBS.

They should be docked and castrated before flies get about, and a little fish oil smeared on the tail to keep away such as may be flying around. Keep a roofed trough in the field with salt in it, to teach them to eat from a trough. Wean them early in August; turn the ewes on the driest pasture, and the lambs on the greenest and freshest. But above all, the lambs should not be put into a field where there are stagnant springs trickling down through the grass. These breed the parasites which cause "paper-skin"—that many-formed and the most fatal malady which American sheep have to contend with. The dampest and foggiest river-bottom, with clear running water to drink, is better than the cleanest and driest hill-pasture, if the latter has no

water but a drooling spring. After the sheep is a year old, the liability to this disease is substantially passed. Beginning gradually, one hundred lambs will soon eat a bushel of bran a day. If they are late lambs they should have all the bran they will eat, to push them forward rapidly for winter. Add a little oats when frost falls, and corn when the snow flies. By New Years feed a bushel a day to one hundred—half bran, and a quarter each of oats and corn. Lambs will winter excellently on this ration and bright corn fodder. When they are first taken up from grass, keep them up abou two days with no coarse feed before them except fodder. (increasing the grain feed while they are being broken in), then let them out an hour or two on some good rowen. Persevere in this about ten days, letting them out two or three times on grass meantime; by this time they will eat fodder nicely; then they may have hay at night and fodder in the morning. If they learn to eat hay first, it is more difficult to break them to eat fodder. They may grow a little gaunt before they come to their fodder; but there is no occasion for concern, they will be all right in two weeks. The same caution applies to them as to ewes respecting grass after it has sprouted in the spring. Green grass and hay will not splice; the transition must be effected in a very few days, and it is the grain ration which must be depended on to let the sheep down easy from one to the other, either way.

TAGGING AND WASHING.

Before they are turned on grass in the spring, all the wool about the vent and hind legs that the dung could touch, should be closely cut away to prevent fouling. This is especially important with breeding ewes; if they are handled carefully it may be done with perfect safety. To neglect this is little less than infamous; the maggots

get in and cause untold trouble to the shepherd and miserable suffering to the sheep. Even in the summer, say about weaning time, all the ewe lambs should be tagged carefully, (they are most liable to foul), to prevent the lodgment of that abominable pest, the maggot. A lamb attacked by them soon succumbs, and after they have had free course for two or three days, it is almost impossible to save its life. As to washing, it is idle to cry out against it, so long as manufacturers continue to buy unwashed wool at a dockage of one-third. No wool-grower can submit to that unless he houses his sheep the year round, thus retaining all the yolk in the fleece. Washing is an evil in many ways, but it is one which must be faced. The only rational course for the farmer is to seek to mitigate it as much as possible by employing careful men, giving his personal attention to every detail, and sternly repressing all cruelty or unnecessary roughness with the sheep. Wash them early on a bright, calm day, and turn them on a clean pasture to dry, where there is no wind; it will not damage them to any considerable extent.

SHEARING, MARKING, ETC.

It is legitimate to let the flock run after washing until the yolk flows to the extremity of the fiber again, say two weeks. But it is not legitimate to shear sheep when they are in the least degree moist with dew or rain; the greatest pains must be taken to keep them dry before shearing, else the fleeces will mold. Neither is it legitimate to pile the fleeces in a damp room, near the ground, nor to do up dead wool in them. But it is legitimate to put into them the tags sheared off early in the spring, after subjecting them to one careful washing in clear, cold water, such as the sheep were washed in. A common grocer's scale should be kept standing near on a

box, adjusted to a certain weight, (the standard to which the flock is bred), and every fleece should be thrown on it by the shearer. If it comes up to the standard, well and good; if not, let the sheep (which has been retained meantime by a strap buckled around behind its fore-legs and attached to a rope suspended from above), be marked for sale. Even if the fleece is "weight," if the sheep shows failing teeth, let it be condemned, too. Let all sheep beyond middle age be weeded out inexorably, especially if the flock is a large one. After shearing is over, put all these culls in a lot by themselves; give them every advantage of the pasture, get them fat if possible, and sell them for what they will fetch. Do not mix them with good sheep; keep the latter separate and demand the highest market price for them; they will find a buyer. Do not be in any hurry about selling wool. Four times out of five it will sell higher in three or six months after shearing than it will at shearing. Borrow what money is needed for immediate use, and let the clip lie in the wool-room until the "bear" movement is passed.

PASTURAGE, ETC.

One acre of fair upland pasture ought to support three grown sheep; it is safe to calculate on this basis. Keep the flocks moving about. It is a good rule to move them every week, if possible; at least every two weeks. It is better to keep a large number of sheep in a certain pasture a short time than to keep a small number there a long time. Sheep are fond of change, even if they can do no better than to occupy a field from which another flock has just been taken. They ought to be turned on to grass early enough in the spring to prevent it from growing up too rank. It is sheer waste to let June grass, for instance, or blue grass, go to seed; it should be kept

so depastured that it will throw up a seed-stalk only here and there, and that only a few inches in height. Sheep will do no good in a field of grass which has gone to seed. They should be taken off in the fall early enough to allow the grass to cover its roots with some matting as a protection in the winter. It is better to take them off early in autumn and put them back early in the spring than to be late in the fall and late in the spring. About the middle of November, if the flocks begin to show signs of falling off, it is well to take a small ration of shelled corn out every day, and sow it broadcast on a clean short sod. This gives all an equal chance and keeps them in good heart until they are ready to go into winter quarters.

WINTER CARE.

Sheep ought to be yarded, except for an hour or two each day, when they may be allowed to run on an old sod or in the woods. If nothing better offers, turn them into a corn stubble; they will take much satisfaction and needed exercise in browsing the stubs. Their yard must be in a dry place, with a good wind-break on the exposed sides, and a shed open on the east or south side, furnished with sets of sliding doors, so that it can be thrown open if desired, or shut up tight with the flock inside in a severe storm. A dry flock should have a shed large enough to allow eight or ten square feet per head, and they should not be compelled to occupy even that, except during storms. Sheep desire a variety in their ration, and to this end the sheep-houses on the farm should be clustered as nearly together as good ventilation will permit, and all the different kinds of feed so disposed in stacks or graneries that some of each can be given out to every flock. Fodder should be fed in an open yard—a space sixty feet square will suffice for one

hundred and fifty sheep—so that the stalks may receive the rains of the next summer, and be reduced to the condition of manure by fall. It is not well to allow hogs to follow sheep with the view of triturating the stalks more rapidly; they foul the feeding ground so that sheep will not eat up their feed clean. Hay should be given in the ordinary slatted boxes under cover—as much as they will eat clean and no more, which can be ascertained in a few days by careful observation. A good rotation is: fodder in the morning, corn at noon, hay at night. Stock sheep should be wintered mostly on coarse feed, with only enough grain to keep them in good heart, say half a pound of corn or oats per head per day. It is more profitable to give a little grain than to keep a flock entirely on coarse feed. With straw of any kind a pound a day should be given. The sheep-house should be littered with the orts and cleaned out once a month; if left longer than that the ammonia arising impairs the animals' health, and forces them to stay out in storms when they would otherwise seek shelter. When sheep begin to scratch their briskets it is a sure sign the manure ought to be removed. All grain should be fed in flat-bottomed troughs, in a clean yard devoted to this purpose, with the troughs so arranged that the sheep will run in lengthwise of them. The fashion of the hay-box does not matter so much as the kind of feed put into it. If the hay is bright and sweet they will stand still and eat it, and not waste it by pulling out their heads and running about. All kinds of grass for sheep-feed ought to be cut when in bloom, or even earlier.

FEEDING FOR MARKET.

Sheep intended for feeding, should be in good order when put into winter quarters, and pains must be taken not to allow them to fall off from the start. Whatever

grain is given, must be given with the utmost regularity —no change, for instance, from shelled corn to the ear. They should have their grain twice or thrice a day, and at every feed the eye of the master himself should watch them carefully; if, after the bulk of the flock have finished, there is still a little grain left, and a few linger and keep on eating, they should be driven from the pen with the others, and the pen closed, or the remnant of feed removed. Sheep should not have grain lying by them, like fatting hogs. The fattening process ought to be pushed to completion, so far as the profit is concerned, in five or six weeks. Merinoes will not do the best that is in them until they are three or four years old. Some feeders consider it the most profitable way to give only enough grain through the winter to keep the flock in as good condition as they were in fall; at the last push them for about three or four weeks; then turn on grass for a month; wash, shear and sell wool and carcass separate.

FULL-BLOODS AND GRADES.

For years I shared in the popular belief that full-bloods are not as hardy as grades; but I am now satisfied, and record it as my opinion, that if full-blood American Merinoes are taken from a stud-flock near by, and gradually wonted to an open-air life in the summer, they will soon learn to endure it as well as the grades. But if full-bloods are brought from a stud-flock in a distant and different climate, they must become acclimated before an attempt is made to depart from the system of housing to which they have been accustomed.

PAPER-SKIN.

This one name covers a disease of several forms, all of them caused by parasites in different viscera. Only lambs are subject to it to any extent. All medicining is

more or less unsatisfactory; the best remedy is, to give once a day a teaspoonful composed of equal parts of turpentine and linseed oil. If the parasites are in the stomach and intestines, it is well to give pumpkins, split in halves and laid flat side up in flat-bottomed troughs divided into small compartments. The seeds are thought to be the most efficacious part. Prevention is far more important than cure; and this must be accomplished by generous feeding, keeping the lamb strong and thrifty all summer, until it is taken off grass; keeping it away from foul springs, and away from pastures on which paper-skin sheep have lately run. The external indications of this disease are a very pale, bloodless, bluish skin, lassitude, and extreme lightness in weight. If the parasites are in the lungs, the animal coughs; if in the kidneys, it urinates frequently.

FOOT-ROT AND SCALD-FOOT.

These ailments ought to be kept carefully distinct from each other. The first is contagious; the second not. Both begin in the cleft of the hoof—a galled appearance—and for the first two or three weeks not one shepherd in a hundred can distinguish between them. If it is foot-rot it will now begin to spread in the flock, and it will go rapidly from bad to worse until the foot is substantially destroyed; if it is scald-foot, it may remain stationary for weeks or months, no other sheep taking it, (though in hot weather maggots may get into the feet), or it may get well of itself. Scald-foot is nothing to be feared; but, lest it should be the rot, it is well to treat it as such. Sprinkle finely-powdered blue vitriol in the cleft of the foot, working it well in. If it is the foot-rot, well-seated, the vitriol must be applied in a warm solution, setting the foot down in it, all the lurking-places of the disease having been previously laid bare by an un-

sparing use of the knife. Turn the sheep on a dry sod, and repeat in a week.

GRUB IN THE HEAD.

When a sheep seems to have vertigo, goes about in a circle, twisting its head around, or makes sudden, erratic dashes, the chances are ten to one that it has grub in the head. Turn it on its back, thrust a strong wheat straw carefully up the nostril, (it will go up five or six inches), withdraw the straw, suck it full of turpentine, put it up the nostril again and blow out the turpentine. Let the sheep up a minute, then repeat in the other nostril.

OTHER DISEASES.

For colic or stretches, caused by a too abrupt change from grass to hay, dose freely with salt. For any kind of vegetable poison, drench a grown sheep with a half pint of whisky, a younger one with less. For diarrhea give two tablespoonfuls of linseed oil. For maggots, shear the wool off close to the skin, and smear on fresh, thin tar until it reaches the skin everywhere. For ticks, give constant access to a box containing three parts salt and two of sulphur, and keep the sheep out of the rain. For scab, dose with sulphur and linseed oil.

These are really about all the diseases which, in the simple and elementary regimen under which sheep-farming is as yet conducted, the American shepherd has to treat. The books are burdened with lists of maladies which trouble the English flock-master, with his more complicated methods and high fed flocks; but they need not give us much concern at present.

POULTRY FOR PROFIT.

WRITTEN BY MISS M. BROWN, OXFORD, OHIO.

All over our country there is a general waking up to the interests of agriculture, and among our best farmers the feeling is growing that success can be reached by careful attention to little things—the developing of the resources within the grasp of every farmer and his wife.

Every one will admit the expediency of keeping fowls on a farm, that his own table may be supplied with fresh eggs and that the butcher's bill may be reduced, throughout the season. But much more than this may be attained with but little outlay, and attended by much pleasure and profit. The old way of getting a lot of hens and two or three cocks of no distinct breed, of letting them look after themselves through the summer and roost in the trees all winter, must by abandoned; for during such a winter as that of '81, some farmers who kept a hundred hens, were without eggs for their own use during most of the winter. The age of the hens should be accurately kept, and they should be made to do service in the dinner pot before they have ceased to be profitable for eggs. I find that it is safest, especially with the larger breeds of chickens, never to keep a hen over two years, and new blood should be introduced through the cocks each year. If you want to loose your young chickens with the gaps, and contend with all the diseases chicken flesh is heir to, keep your own cocks from year to year, until the relationship between mother and offspring shall be as intricate as a Chinese puzzle.

How shall poultry raising be made profitable to the average farmer? is a question worth studying, and I gladly give you my experience, gained by actual practice for a number of years.

In the first place do not try to keep too many hens. From twenty-five to fifty at the most, through the winter, but give this number the proper care and you will be surprised at the handsome profit.

First, select a suitable place for your chicken house, well drained, with a southern exposure, and sheltered by buildings on the north and west, if possible. Whether you have this shelter or not, by buildings, plant an evergreen hedge on one or both of these sides; arbor vitæ is my choice: Trees two feet high can be had for a few cents each, and if set three or four feet apart, will soon grow into a dense hedge. My own, set nine years ago, is now twenty feet high, and is a comfort to the chickens every day in the year. This hedge is their "city of refuge." They run to it for protection against wind, rain and snow storms; they hide under it by day to escape the hawks; and all through the hot months of summer climb among its branches at night to be out of the reach of skunks and weasels. During the terrible heat of the past summer, 1881, this hedge was the chief source of consolation to the young chickens. They would crawl under and among the close branches for shelter until on close inspection, sometimes, it looked like a tree bearing chickens for fruit. Plant this hedge by all means; and then build your chicken house within its sheltering protection and you have gone a long way toward making poultry raising a success.

A house fourteen feet long and six wide can accomodate comfortably, fifty chickens through the winter. My own is built against the barn, seven feet high at the back, with a slope of two feet for the roof; half of the front is of glass to let the sunshine in, and this half is always kept supplied with fresh chip-dirt. To look in here some bright winter day would make you believe

chicken happiness was a cheap thing. There is a board three inches high to separate the dusting place and the part over which the chickens roost. It is all boarded over the floor with two inch oak planks, so that not even a weasel or mouse can get in when the door is closed. Dry dirt is kept over the floor to absorb the droppings, and during the summer months is scraped into a barrel once every two weeks. Every spring this house is whitewashed, inside and out, and occasionally kerosene oil is applied to the roosts and turned into the cracks.

I have never found it best in a small chicken house like this to have the laying boxes connected with it, but have a small slide door through into the barn, and there have boxes and kegs arranged in a suitable number. The objection I have to the nests being so close together is that in cold weather, when closely confined, for the lack of other modes of exercise they scratch their nests to pieces, break, and often learn to eat their eggs. During the summer months most of the hens vacate the house at night, but as soon as the weather begins to get rough, can, by a little coaxing, all be gathered in; and before this time I try to sell off and reduce my stock to the number that can be comfortably wintered. When the ground is covered with snow I feed liberally every morning with what is called ship-stuff—a mixture of bran and shorts—wet with scalding water and then cooled with skim-milk; also feed scraps from the table, occasionally sunflower seeds, and cayenne peppers mixed with the bran; and at noon give a light feed of some kind of whole grain. Let the amount be regulated by the weather. Chickens do much better when made to forage for themselves, and they destroy a vast amount of weed seed and insects of every description, the Colorado beetle excepted. I always make my hens get down off

the roosts and come out doors to get their feed, no matter what the weather is. During a snow storm we always clear away the snow for quite a space around the house so they can get at the gravel and come out for fresh air and exercise. An iron kettle holding a couple of gallons of water, is sunk within two inches of the top in earth and is kept full of water. During the summer cobble stones are thrown into the kettle so the little chickens are in no danger of drowning. During very cold weather the water must be hot to melt the ice, and as soon as it cools sufficiently the chickens will gather and drink until the water is lowered several inches, and thus leave space for the next watering. A trough long enough for all the chickens to gather around is best for receiving the feed.

One of the main points in poultry raising is to secure early pullets, and this can be done by a little care and pains. Some time in February or the fore part of March select the very roundest eggs, gathered on warm days when there is no danger of their getting chilled, and if possible set three hens at a time and if they should not hatch well give the chicks to two hens. Take extra pains with the nests and do not give the hens over thirteen eggs each. A good body of earth in the bottom of the hatching boxes insures steady warmth, and is always an advantage. Remove a part of one side of the box and have it so arranged that the hen can walk directly on the nest and is not obliged to jump down on the eggs. When the time nears for the eggs to hatch prepare some coops that can be perfectly closed at night, and have a little yard about the coop for the chicks and hen to run in through the day. The coops should be located just south of the arbor vitæ hedge. Feed the young chickens with the bran-mash and corn

bread, but do not give them clear, raw corn meal dough.

Plymouth Rock and other hardy varieties of chickens, with these few simple arrangements will thrive through any weather our climate can produce during the early spring months. Pullets hatched in March or the first of April, will mature and begin laying in September, and will pay for themselves before Thanksgiving. I have a pullet hatched during the terrible snow storm last spring, that has at this date, November 1st, laid twenty-five eggs, and shows no signs of sitting yet.

During the hot weather look out for vermin, and grease your sitting hens under the wings with a mixture of lard and kerosene. If you have not many hens condense your broods of little chickens through the hot weather. I had two hens this summer that raised twenty-five each.

The care of the poultry ought to be given to some member of the family and let an accurate account be kept of all outlay, and also of the amount sold. There is no better way to teach a child strict business habits and to teach it self-help and economy, than by giving it an interest and share in the profits,

A small piece of ground planted in sun flowers, Dhoura corn and cayenne peppers will go a long way toward feeding the chickens through the winter. The demand for poultry and eggs is on the increase, and it is the part of wisdom for the farmer to meet this growing demand and benefit not only himself, but the consumer.

CHAPTER XX.

TIMBER GROWING.

The number of farms on which timber planting should at once be begun is large and constantly increasing. Even in localities like my own, where less than thirty years ago the question was how to get rid of the timber, and deadening and burning was resorted to for clearing the land, there are now many farms without fire-wood and very few on which there is any rail timber left. On all these farms timber plantations should be started at once; and even on many which still have a supply of timber, it has passed its prime and there should be new plantings made. As a rule, the least valuable lands should be planted in timber; that which is too rolling to cultivate, and even lands which have been reduced in fertility by long cropping, will grow trees well.

The profits of timber on such land will often exceed many times, all that could have been made from them if cultivated; and when planted in Locust it renews itself after being cut, and the second crop grows in two-thirds the time required by the first, and will yield a regular income for several years. I have had ten years experience in growing timbers, but for thirty-one years have lived in sight of several groves of locust, and so what I state in this chapter is fact, and not theory. My experience extends to but three varieties of timber, Locust, Catalpa and Soft Maple, and of these, in all localities where they will thrive, I should expect the greatest

profit from the Locust. If fire-wood, or a quick growing wind-break is the object sought, I would advise the planting of Soft Maple. I cut a half cord of wood last spring trom eighteen trees of Soft Maple occupying a single row fifty feet long, which had been growing nine years; This was at the rate of over twenty-five cords to the acre with the rows one rod apart. I have trees of this timber eighteen years old which measure from three and a half to four feet in circumference, and I estimate they will make over a half cord each. Near my farm is a plantation of two acres of Locust which was started in 1850, the seed being planted in hills like corn. This was cut off and marketed in 1868, and I know that it brought several hundred dollars per acre; but as it has changed hands I have no way of ascertaining how much. In 1879, eleven years after it was cut off clean the owner began cutting the second crop of posts, and I visited it and made a careful examination of it. When planted in 1850 the trees were four feet apart each way; but they were thinned out and sold for bean poles and stakes, so that at the time it was cut off the trees stood eight feet apart. When I visited it eleven years later, I found that each stump had thrown out from three to seven sprouts, and the largest of these were now large enough for posts and cutting them out was a positive advantage to the remainder, and as the stumps averaged over four of these sprouts I found that over two thousand posts could be cut and still leave the original number of trees—680. I have never known these posts to sell for less than 20 cents each, so it will be seen that this land would yield a good income on the second crop of trees after they were eleven years old. For ten years to come from the cuttings and in twenty years from the first cutting, if the straightest and best trees were

allowed to stand, one to each stump, there would be 680 trees that would make several posts each. If allowed to grow until each tree would make ten posts, at 20 cents each they would bring $1,360.00, and the wood from the branches would pay all the expense of cutting and spliting. There is on this farm from twelve to twenty acres of Locust timber, most of it on hillsides, all of which was planted, and there is growing on the land a heavy crop of blue grass which pays a fair interest on the cost of land and trees.

When I came to Ohio, in 1848, there was growing on the farm I moved upon a double row of small Locust trees, twenty rods long. I do not know how long they had been planted but I could easily carry one of them, and did dig up and carry on my shoulder several of them to set around the house. In 1867 these trees were cut—there were thirty-three of them—and they averaged twelve large posts each and half as many small ones, which were used for fence stakes. Allowing one rod of ground in width, which these trees occupied, there was just one-eighth acre and the trees were scattering, less than two to the square rod. The second growth from them is over two hundred trees, tall and straight; many of them will make three and some four post cuts to the tree, and there have been posts made from this second growth for one or two years past. I have seen a gate post that squared six inches made from a Locust tree that grew from the seed in eight years, and I now have on my farm a ten year old tree that will split and make two posts. I know that in some localities the bores injures the Locust trees, but I think it is usually isolated trees that suffer most, and I have never known a plantation seriously injured. I believe there is no investment that with perfect safety

offers so large profits as the planting of Locust timber. There are lands suitable for this purpose which can be bought for $25 to $35 an acre, which, if planted in Locust timber, in ten years would be worth from $300 to $500 per acre, and at the same time would be taxed for perhaps less than $50 per acre. There is no danger of overstocking the market, and those who begin planting Locust timber will soon reap a rich reward.

The seed should be sown in nursery rows, in April or May, and must be prepared by scalding. Put it in a tight vessel and pour water nearly boiling hot over it and let it stand until cool. You then find about one seed in twelve swollen to three times the ordinary size; spread them in the sun till dry enough to handle and then separate these swollen seeds, which, if the quantity is small can be done by hand, or a sieve can be used which will retain the swollen seed and let the remainder pass through. The seed which does not swell must be treated with the hot water repeatedly; each time a larger proportion will swell, and from four to six applications of the hot water will be necessary. Seed prepared in this way will come up as quickly as corn, but if the weather is not suitable for planting it may be kept in a cool place for a week or more. If it must be kept, spread it an inch or so in depth in some vessel, and set on the cellar bottom and cover with a damp cloth. Sow in shallow drills three feet apart, eight to twelve seeds to the foot of drill, and cover an inch deep. Give good culture and they will grow from three to five feet high the first season. Always set out in the plantation at one year old. The growth will be checked less than if allowed to stand two years. In planting the trees you want the land thoroughly prepared by plowing and harrowing; then lay off the rows with the two-horse plow

so as to have the furrows deep enough for the roots; stretch a line across, or if you prefer cross mark with a small plow. You will need a boy to hold the trees and two men with light shovels to put the earth to the roots. Two men and a boy will plant about an acre a day in this way. The trees will get well established and make quite a growth the first year, but it is best to cut back close to the ground early the next spring, as they will make a strong vigorous growth this season and have straighter trunks. They should be cultivated for two summers after which they will occupy the land so that the weeds will do them no harm. I advise planting four by four feet, as the growth will be straighter when planted close. At about four years after planting cut out every other row. They will be large enough for bean poles and occasionally one will do for a fence stake. A few years later, when large enough for fence stakes or vineyard poles, cut every other one. This will leave the trees eight feet apart each way, or 680 to the acre. After the first row is cut out sow in grass and pasture with sheep or young cattle.

In growing Soft Maple seedlings, you gather the seed as soon as ripe in the spring, which is about the time strawberries ripen, and sow at once. It will come up as readily as beet seed and grow from three to five feet high the first summer. In setting these in plantations, unless I expected to get sale for a part of them for shade trees, I would put the rows eight feet apart and the trees four. A double row of these planted along the North and West of exposed fields will afford protection to both crops and cattle, and in prairie countries, it is said that where one-sixth of the land is occupied by wind-breaks the remainder will grow enough more grain to pay for it. Where a wind-break is needed for the buildings, I

would advise the planting of evergreens. Cedar or Arbor Vitæ are probably the best. They will be a great comfort during the winds of winter and spring.

The Catalpa has been largely recommended as a timber tree for some years past, but my own experience with it shows that though it may be a valuable timber it has qualities which render it inferior to the Locust. I have been growing it for four years and I find it to be of much slower growth than the latter, and very much inclined to branch and grow scraggy, Out of several hundred which I have growing not one in twenty are even passably straight. The seed of Catalpa is light as that of parsnip, and will not come up if sown deeply or on a stiff clay; and as the young trees, when they are four inches high, can be transplanted as easily as sweet potatoes, I would recommend that the seed be sown in a frame, in prepared soil, and where they can be protected.

There is one other timber which I have had no experience with, but which would undoubtedly by profitable to grow, and that is Black Walnut. The seed must be planted in the fall and it is well to plant where they are to grow, as the trees do not bear transplanting well.

CHAPTER XXI.

COUNTRY HOMES.

BY MRS. J. C. ALDRICH, OF FULTON COUNTY, OHIO.

As success in farming depends largely upon the arrangement and management of the home, certainly a volume on this subject would be very incomplete without a chapter specially devoted to the household. And even a chapter seems insufficient for mention of the various topics connected with this department.

Home, in its widest sense, signifies "all that pertains to a dwelling place." With this broad heading for our chapter, such a throng of subjects crowd to the front and demand the first place in importance, that it is difficult to decide which shall have the preference; but endeavoring to forget for the moment the jostle and clamor for pre-eminence of hygiene, order, cleanliness, adornment, etc., etc., we will go back of the home for our beginning.

A farmer's possessions may stretch over a vast area of country; his herds may feed on a thousand hills; he may enjoy the reputation of being a very rich man; yet, the impressions made on his character by his home and its surroundings, will unmistakably stamp his real worth in society. It is therefore essential that he begins right in life. We would by no means tarnish the holy sentiment of love by cold calculations in profit and loss; but would simply suggest that all mingle a little common sense in matters of love. For instance, a man should

love the woman he is capable of making happy: and a woman should never imagine she loves the man whose business she despises.

The young man who decides to be a farmer, should select for his companion a woman every way fitted for a farmer's wife. We do not mean by this a woman of the greatest physical endurance and the least mental capacity; the largest capacity for acquiring wealth and the least desire for spending it on artistic tastes; nothing of the kind. But a woman whose heart is filled with a love for the country, who goes to her home like a queen to her throne, proud and happy and independent; one who does not regard domestic life as degrading drudgery, or the occupation of farming as an inferior one. Such a woman would help to build up a home that would be a blessing to its inmates and an honor to the farmer's vocation.

But we have to admit that all farm homes are not models of perfection, even where the husband and wife are united in their love for the business. We see many farmers with large farms living in homes destitute of books, paintings, music, everything in fact, that will not yield an interest in dollars and cents. In most cases of this kind the proprietor has commenced life with limited means, and found economy and retrenchment more easily practiced in and around the house than anywhere else in farming. Certainly, underdraining must be extensively done to insure the growth of crops; long lines of fences must be made to protect them, and large barns must be built to secure them; for the crops of the farm are the money-producing element, and must not be neglected. Then the long list of farm implements and machinery necessary for carrying on modern farming must be filled before any furniture for the house, beyond the

barest necessities can be afforded. By the time prosperity becomes established, the enforcement of rigid frugality in everything pertaining to the house has become a habit so fixed in the nature of both husband and wife, that long after the necessity for its practice has ceased, we find them subjecting every proposed improvement to their utilitarian test, and opposing any outlay for beautifying their home as a needless expense.* What their poverty once made an excusable economy, their present circumstances render a very censurable parsimony. Very often the surplus that should be expended in bringing cheer and comfort to the household, is deposited in the bank, awaiting a favorable opportunity for investing in more land.

It is a mistaken notion with some, that they must wait until they have grown rich before they begin to gather around them the enjoyments of life.

The little cabin in the clearing may contain all the elements of refined living; the evidences of intelligence and culture sit as gracefully within its neatly whitewashed walls as in the mansions of the wealthy; ivies and eglantines cling as lovingly to its rude logs as to the stately columns of opulence; and the fragrance of flowers floats in through its tiny windows as freely as

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*Mrs. Aldrich has opened a truth, a secret to many, that the disregard to taste and beauty in some farm homes is the natural result of long-continued necessary economy. But because natural, it does not follow that it is right. It is a pitiful thing to see a man and woman give all the strength and vigor of their lives in the effort to secure an "independence," and when they have secured it find they have forgotten how to enjoy it. Yet such a sight is to be found in thousands of farm homes to-day; and there are thousands and thousands of farmers who, having acquired a "competence," still rise up early and work late, and pinch and deny themselves and their families every luxury, when they could not tell what they were saving the money for. R. S. T.

through a plate-glass casement. There is such a wealth of material around every country home for creations of beauty. The scraggy, gnarled sticks may be made into rustic work; the stones lying around in the way, into rockeries, the lichens into brackets and hanging baskets to receive trailing or climbing plants; even a great, ugly stump in the yard may be made a thing of beauty by hollowing out the top, filling with earth and planting with trailing vines. There is no need of waiting for the accumulation of riches to make a pleasant home. No matter how humble your beginnings, take to your home all the beauty and happiness within your reach, and by the time you are ready to build the great farm-house that has long been a castle in the air, you will find so many bright memories inwoven with your life in the dear little cottage, "so many precious things you can never take away," that, with regret you will move, "out of the old house into the new."*

IN AND AROUND THE NEW HOUSE.

The building of a farm house should be the subject of serious consideration. You are not building for a renter who can leave if dissatisfied when the first crop is harvested; but you are making a home for yourselves and

* The family, also, that has learned, during the days of hardship and toil, to make much of every gleam of beauty, of every opportunity for intellectual advancement, of everything that leads to taste, refinement and culture, will find when the new home is secured, that they have not in the making lost the faculty for enjoyment, and that they will go into the "new home" and all its improvements as though they had been all their life long accustomed to its enjoyments. I have seen elegant country residences, with all the attractions that money could buy, in which the older members of the family spent their time in the kitchen or back yard, because they "felt more at home there." A melancholy confession that their former home had been all kitchen and back yard, and that they felt ill at ease in a home of refinement and beauty, because they had never been accustomed to it. R. S. T.

perhaps your children after you; therefore all the wisdom of the family should be brought to bear upon the work.

The shape of the house should harmonize with the site it is to occupy, and the grounds about the house must of course bear a relation to the size of the farm. If the farm is large, consecrate a generous piece of land to ornamental purposes. But whatever the shape or size of farm, avoid that orthodox walk, straight, and narrow, hedged in with shrubs, from the gate to the front door; and avoid that greater abomination, a narrow front yard. Nothing helps a passer-by to form a more correct opinion of the inmates than the surroundings of a farm house. A farm with hundreds of broad acres stretching away in the distance, laden with the money-yielding grain, and a little seven-by-nine picketed yard in front is a sad sight. One cannot but fear that the owner is a narrow-souled man, with narrow doctrines and narrow ideas of the higher nature's demands. If your farm is too small to devote much ground to merely ornamental trees and shrubs, grape arbors, cherry and pear trees, small fruits, etc., can occupy space at the sides, and will not harm the roses and lilacs if they are not separated from them by a "paling." But leave the lawn in front of the house smooth and unbroken by trees of any kind. Have a piece of ground to one side, plowed deep, and made rich and mellow for the main flower garden. Beds — not too many of these—may be cut in the lawn, round, oblong, or any fanciful shape, and planted with dutch bulbs. These make a gorgeous display in early spring. The dullest observer will turn to look at a group of these gay-colored flowers in their emerald setting of velvety grass, and remember them long as a picture of beauty. Between the rows of bulbs, annuals or geraniums may

be planted, that will keep up a show of flaming color until snow falls.*

Plant plenty of hardy flowering shrubs and perennials; these, when once planted, are little trouble, and afford much satisfaction. In making your selection, be careful to get a large proportion of fragrant shrubs and plants. The very breath of heaven seems wafted to us in the fragrance of flowers. If you have a fine old forest tree near the house, spare it—for the love of beauty spare it. You can supply its place with nothing half so grand.

No special directions can be given for the approaches to the house, as the shape of the ground and the space devoted to the yard must decide this in each individual case. Many houses are built so near the road as to preclude all possibility for anything but a straight drive at the side. This is a great mistake; it gives the house too much the semblance of the toll-gate or wayside inn; while a fine drive, sweeping up under over-hanging shade trees, always gives a spacious, villa-like appearance even to an ordinary house. The walks need not not be straight or rectangular, even in a small yard. An oblong bed in

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* I confess I am not particularly in favor of the "piece of ground" for a flower garden. It has always seemed to me that the growing of flowers in a field, like corn, should be left to the professional flower-grower, and that the flowers about the home should have a "fitness" to the place where they are found. I would as soon think of taking all the brackets, window-curtains, pictures, mottoes, vases, shells, fancy work, etc. about the house to one large room, and arrange them artistically there, as put my flowers in one large "flower garden." Flowers are the outward adornments of the home, as the articles I have named are the inward adornments. A small, round bed here, an oval one there, some choice flowers under this window, a flowering shrub by that—a little edging of bloom, found unexpectedly—would be my ideal. But Mrs. Aldrich's taste is good, and she may have better judgment in this than I.

R. S. T.

front of the house, set with foliage or flowering plants—the path curving to the right and left of this, one going to the front door, and the other passing round to the sitting-room or kitchen, is very pretty.

Do not allow the back yard to become a very Tophet for the whole place. Allow no accumulations there not directly connected with the conveniences of the house. The back walks, being matters of convenience, may connect directly as possible with the various out-buildings. Let them be built of plank, or some substantial material, and safely above "high water mark;" this will secure you against "stormy weather" in the house during a muddy time.*

There are evidences of neglect about some country homes worse, even, than the utter absence of all ornamentation. Among the most odious of these is the stench from hog-pens, hen-houses, etc., that laden all the atmosphere about the place with their disgusting odors. This is inexcusable. Some attempt to apologize for the negligence by saying that during the hot, busy season they have no time for the necessary purifications. We all understand that cleanliness is the best disinfectant in

*Mrs. Aldrich lives in a timber country, and naturally suggests plank; but after a very extensive observation in all sections, I know of no better material to suggest. Gravel, even where it can be had, is liable to track into the house; tan-bark stains the carpets; flag stones, unless much smoother than can usually be obtained, hold water and mud in wet weather, and are always unpleasant to walk on. Brick walks are expensive to lay, and in muddy countries troublesome to keep in order. Get 3 by 3 studdings, hard wood, lay them 2½ feet apart from out to out; set them firmly on stones or brick; get full inch lumber, 6 or 8 inches wide, and sawed at the mill into 3-foot lengths, and you can easily make a walk that will always be clean and comfortable, and will last for years. In laying your boards, if green, put close together; if seasoned, leave a quarter-inch crack; put two 8-penny nails in each end of a board; and as soon as a board breaks or gets loose, repair it. R. S. T.

use; but a penny's worth of copperas sprinkled on and around the unclean spot, will effectually neutralize its loathsome exhalations, and any one may avail himself of this escape from allowing his place to become a public nuisance.

Another is having no means of reaching the house with a team save through the barn-yard, which in such cases is strewn with all kinds of farm implements, from the new self-binding reaper, down through all conditions of dilapidation to the most absolutely worthless trash. After a meandering route over, around and between these, you are halted at the kitchen door, where pigs, ducks, etc., mix with their own filth that thrown from the kitchen in the form of slops and refuse of all kinds. Finding here their element, they grunt and waddle about with perfect impunity, evidently considering themselves part and parcel of the family. Holland saw a great similarity between hogs and human beings, but we have no right to cultivate this similarity by such close association, and we have no right to disgust the senses with such loathsome sights and scents about a human dwelling. We would gladly forget such places; but they exist, and instead of turning from them in silence, we should point out their imperfections and endeavor to bring them up to higher ground.

The idea that farmers and their families have small capacity for enjoying the elegancies of life, and therefore need little, has so long been popular among professional men, that many farmers have come to believe it themselves; and the habit of being satisfied with the husks of their labor while some one else receives the kernel, clings to them like mildew to linen, and regarding themselves as a kind of intermediate beings between the animals they feed and the men they vote for, they imagine rude

living and coarse manners more in keeping with their occupation than the comforts and refinements of a well arranged home. Such need missionaries sent among them to proclaim the gospel of the grange.*

Turning from these unpleasant phases of country life, we will go back to the pleasant home where all love to loiter under the pleasant shade trees, among the flowers, and shrubs, and beautiful walks. But we go into the house at once. We have a difficult task to perform. Those who have always been making the old home pleasant and beautiful, come into the new home with cultited tastes and well informed judgment in all matters of furnishing and arrangement; these will need no help of ours; we trust, however, such will be patient, and not consider as useless detail our efforts to help those who have been waiting to move into the "new house" before they commenced a systematic course of furnishing.

As it is the most common way of building in the country, we will suppose the house is an "upright-with-a-wing" and an "L" extending back from the wing, (we would suggest that the "L" be rather disproportionate in length, or the proprietor may be required to build an addition for a summer kitchen.) This furnishes convenient space for a farm house, and though not as elegant in

*It can hardly be thought strange that so many farmers have low opinions of themselves and of their calling when we remember that from time immemorial the farmer has been supplied with literature prepared for him by those who look down upon him. His babies are supplied with story-books which tell of the "rough, ignorant, country boy;" his boys are fed on wonderful tales of how some one, though *only* a farmer's boy, had gone to town and become a gentleman, and when he gets to be a man he takes a political paper, edited and managed by men who regard the farmers as so many "head" to be brought up to the polls and voted. Any wonder we find many farmers who seem incapable of rising to a due appreciation of their rights and of the dignity of their calling? R. S. T.

appearance as a square house, it has the advantage of costing less for brackets, columns, etc., without which a square house would be an unsightly object.

With this style of house we usually dispense with the convenience of a hall, but the sitting-room opens on a spacious veranda, and all the glory of the front yard is continually spread before the family, which we think pleasanter than having the sitting-room in the rear of the parlor.

Let the veranda be one very paradise. First impressions are most lasting, and while one is waiting here for admission, your home is being photographed in his memory by these beautiful surroundings. How different the picture will be from that which, if, by the "shut-up-go-to-the-back-door" look of things at the front, he is compelled to go round to the kitchen to gain admission, and work his way in between wash-tubs and through the steam of boiling clothes, to a darkened sitting-room, destitute of any object to engage his attention. We must enter a protest against this shutting up of the whole front of the house practiced by some.

Since the advent of screens, no excuse remains for families cloistering themselves in this perpetual shadow and gloom. Screens are not expensive luxuries, and certainly for their price, no man would allow himself and family to be tortured through the day with flies, and of evenings be bitten and stung by mosquitoes and all manner of moths and beetles that swirl in and swoop down on unprotected victims. Let the house be provided with screens, and throw open the doors and blinds and let in the joy-giving sun-light and the fresh, pure air.*

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* A dark house is seldom a clean house, and never a healthy one. Sun-light and air are Nature's disinfectants and tonics. If the light reveals dirt and dust, so much the more

Make the front door look so pleasantly inviting that visitors will know they are expected to enter there. Let an ivy arch the door-way with its rich, glossy green, or place a Speciosa Fuchsia on a bracket, and train its long, vine-like branches above the door, and it will gladden you all summer with its masses of drooping buds and blossoms. If your porch is shady, plant the graceful Adlumia; it is the very lace work of all climbers, with its long vines bearing such an abundance of fringy foliage and delicate flowers you may festoon the entire veranda.

Let the furnishing of the sitting-room be such as to sustain the good impressions made by outside appearances—tasteful, substantial, and for the use and happiness of the family.

It is useless to attempt to give directions in reference to styles of paper and carpets. The prevailing styles at time of purchasing must be the guide. Now rich, dark colors for both are sought, while a few years ago neutral tints for paper were recommended by good authority, and a soft, gray ground, scattered over with wreaths of roses and delicate flowers, was a lady's ideal of beauty in a carpet. No one need regret having bought when this style prevailed, for it is pretty and always will be.

The sitting-room carpet should be no flimsy, cheap affair, and better a pretty, bright, rag-carpet than an ingrain or brussels, if such a one would cause you to worry about its being spoiled by every-day use. Make this room especially bright and cheery. This is the hearthstone, the family altar, where all come at evening to gather rest and strength and blessing. Let the table be fur-

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need for the light. The farmer is learning that it is ruinous to keep stock in dark stables; but some have not yet found out that the family is entitled to as much thoughtful care as the stock. R. S. T.

nished with books and papers and magazines of sterling worth, a stereoscope and views, suitable games; in short, whatever elevates, entertains and develops the mind, should have a place here. Have plenty of easy-chairs—not necessarily expensive ones, but such as will give comfort and ease to the occupant. These may be made of old chairs bottomed with coffee-sacking and covered with pretty red calico. It has been said that red is the glory of color. We would have red predominate in the sitting-room. Everything looks bright and warm in its glow. Let the table-spread be red, the couch and rug be lighted up with it, and whatever hanging, fancy work, such as an air-castle or a balloon for this room, should be trimmed with red; tidies for the chairs, and mats for the table, should be white, as they require frequent washing, and would be prettier on the red than any color.

Do not commit the blunder so often noticed, of carrying all the family pictures and cheap chromos, in fact, everything in the shape of ornament, to the parlor, leaving the rest of the walls to stare at you in naked ugliness, while the parlor presents a heterogeneous collection, varied and contrasting as the contents of a Yankee peddler's wagon.

The family pictures are of course dearer to the family than any one else, and should therefore be appropriately grouped in the sitting-room or family sleeping-rooms, where their dear remembered faces will beam on those who love them with such tenderness as to make them quite forget the old-fashioned clothes and oddly combed hair, which often prove very amusing to visitors.

There are some very pretty chromos—they are mostly copies of historic paintings, and through them we may gain some idea of the original—for this reason we gladly

give them place in the sitting-room. The best of these may be taken to the parlor if you have no oil paintings or steel engravings. Not many farm-houses are very rich in works of art, but farmers' wives must make this a part of their religion: to feel satisfied with things within their reach—*but reach as far as you can* in the way of advancement.

In buying, do not select the flashy, high-colored, barn-yard scenes so common. Nature furnishes for us better pictures of this kind; but get something good of its class that will bring a lesson with it.*

Nothing is more perplexing to the housewife in the way of furnishing than the matter of curtains, for style is so vacillating and changeful in this item. If she attempts to follow this fickle dame in this, as in many other things, she will be kept on the rack much of the time, besides finding on her hands a greater supply of curtains than her means will warrant in getting. A better way is to decide that "a thing of beauty is a joy forever"—get what she thinks pretty and be satisfied with it, no matter what Mrs. Grundy says. This rule of course will not apply to ladies' bonnets; but in the matter of furnishing a farm-house is better than the constant worry about things getting out of style.

We think for the sitting-room lace is prettier than "cheese-cloth" or cotton flannel. It gives a sweet, airy look to the room. Do not hang your curtains flat against the window, but fasten to a cornice. If you cannot af-

* I sometimes see farm-houses in which the walls are almost hidden with a mass of cheap prints, costing little individually, but enough collectively to pay for one or two really handsome pictures in good frames The overdone mass of cheap prints gives an idea of cheapness; the one or two better pictures give an impression of taste and refinement.

R. S. T.

ford to buy this, make one; make a shelf six inches wide, round the outside corners, and fasten substantially to the top of the casing; tack the curtain to this. Puff lace with cambric (the color to match other fancy articles in the room) and sew on pasteboard the proper length, six inches wide. Tack the lower edge of this to the curtain and shelf. Behind this, on the shelf, you may set a dish of tradescantia filled with water, and its glossy leaves drooping down over the lace, is very pretty; or a long piece of Madeira vine may be broken off, the end inserted in a bottle of water, which may be hung under the edge of the curtain, and the vine carried up and across the top, and trail down the other side, thus arching the window. Both these plants will keep bright and beautiful as long as you keep up the supply of water—will throw out new roots and grow, not seeming to miss the parent roots.*

Set apart one room for a library—the one at the end of the wing, usually occupied as a bed-room in this style of house, is convenient. You may not be able to bestow much on its furnishing at first—a book-case, table, chairs, and supply of stationery will do for a beginning; but being set apart, it becomes a sort of altar to the educational advancement of the family, and each member will love to bring to it offerings of books, curiosities, specimens of natural history, geology, entomology, etc., and soon it will become a very treasure house, in which all

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* Among the furniture of the sitting-room, in every family where there is any taste for music, I should give the organ a prominent place. Nothing so binds together a family, or makes home so home-like, as music. When brothers, sisters, father and mother can gather around the organ and join their voices in the "social joys of song," it forms a wonderful home tie, and awakens in every heart a love for home. R. S. T.

are equally interested, and through which a vast improvement will come to the family.

The library may have a bay-window, and being connected with the sitting-room by double doors, can be easily warmed, and thus fitted to serve the double purpose of library and conservatory on a small scale; and this, too, would realize, in many cases, the wife's dream of years—a place to keep her plants where she could enjoy their fragrance and bloom while winter holds revel without. (Too often the wife's wishes in these little matters are considered unimportant, and she is doomed to await her entrance into the "home not made with hands" to realize her visions of beauty.)*

As we have no hall, here must be a niche somewhere, either in library or sitting-room, for a hat-rack.

THE PARLOR

We deem of secodary importance compared with the sitting-room; secondary, because a family can get along very nicely without a parlor, while they cannot without a sitting-room. In parlor furnishings there is a greater demand for money and less for ingenuity than elsewhere, as home-made articles here seem rather out of place.

The different pieces of furniture must not war with each other in point of costliness; an expensive table with poor chairs is in bad taste, and other things being good, a shabby carpet may spoil the effect of all. A "parlor-set" is necessary. Variety is pleasing in some places, but indulged too far in the parlor suggests auction sales.

Let the books and pictures be well chosen, and good as the finances of the family will warrant. Do not look so much to show in these articles as to intrinsic value. No matter how costly the frame, a daub will only violate

* There is no place where flowers do so well as in a room adjoining one in which a constant fire is kept. R. S. T.

the cultivated taste that could enjoy an exquisite piece without any frame. Harmony, and a quiet, unobtrusive elegance is more satisfying to the refined mind than glare and ostentation.

THE DINING-ROOM,

if a separate apartment, needs little more than an extension table and chairs, with convenient connections with china closet, pantry and kitchen. If the dining-room *must* be in connection with either sitting-room or kitchen, and the latter is large, let it be there, in the winter at least; and doubtless the parties most interested, the farmer's wives, would say let it remain there still through the summer, and let the cook-stove be moved to a summer kitchen. This is a mooted question, and one on which farmers and their wives more generally differ than any other.

The theory that supply follows demand—for instance, man's needs demanded a thumb, and therefore a thumb grew—may be true in some things, but the masculine patience has never yet seemed to reach the demand for moving stoves, and the very terror that over-shadows him when he receives notice that such a task is before him does not indicate very rapid development in that direction.

We see no way out of the dilemma except that a dining-room be made a permanent fixture in the house in addition to the sitting-room, else the proprietor will probably be required to go on moving the stove out every summer, until he completes his allotted three score years and ten.

The converting of a sitting-room *three times* a day into a dining-room, and as many times back to its original state, implies a great deal of useless work, and labor-saving in the house-work on a farm is important. But

while we would most earnestly advocate doing away with unnecessary work, do not suppose we think it of little consequence where and how farmers are fed. The good or ill breeding of a family is more plainly marked at meal-time than any other hour of the day, and we would by no means under-value the influence of pains taking in the dining-room. We would have the table laid with care—with clean linen, shining dishes and cutlery—have the food skillfully cooked and served in different dishes, and the different likes of the family properly regarded that all might relish their meal. The room clean and sweet and free from flies. There is no reason why a farmer's dinner table should not indicate refinement and culture in his family; certainly there is nothing in the vocation that necessarily makes those following it coarse and rude *

It is the improper management of some farms and farm households that disgust so many persons with the business. The uncouth manners, disregard of personal appearence and inattention to intellectual improvements sometimes found among farmers, is accepted as natural conditions of and inseparably connected with farm life.

"Those dirty farmers" that are such a terror to some are no dread to the systematic house-keeper When the great dinner bell "calls them from labor to refreshment," she knows that they will enter the back porch (or a room done off in the wood-house for the purpose,) where plenty of soft water, wash-basins, soap, towels, combs, brush and looking glass, are all conveniently ar-

*A separate dining-room is an excellent thing when made comfortable, but on a chilly day I would rather eat in the kitchen in comfort, than be invited out to a stately dining-room without fire, and shiver over your meal with the impression that your host keeps the room cold for fear her guests should linger too long at the table and eat too much. R. S. T.

ranged. A long case—not necessarily ornamental—holding slippers for each, and dressing-gowns or clean linen ulsters hanging above. Everything necessary for making them tidy is ready for their use, and instead of its being considered a trouble, a man very soon regards it as a luxury to put off his soiled boots and rest his feet in fresh stockings and slippers, and out of respect for wife and daughters he gladly dons a garment that will make him presentable at table, and feels more self-respect for having done so. His example is "a law unto his household," and his men follow it as a matter of course

THE KITCHEN AND PANTRY

of the farm-house constitute a very important department. By too many the kitchen is considered unimportant. Any kind of a room with any kind of furnishing will do for the kitchen. But the kitchen is the grand laboratory of the whole domestic economy of the farm. A man's successful farming depends more on the management of his kitchen than on the acreage of his wheat. Lack of system here is felt in every department of the farm work. If half an hour is lost in the morning on account of inconvenient location of pantry, cellar-way and wood-shed, (or worse, poor wood,) and want of proper utensils for cooking, and there are four men, that lost time is equivalent to two hours for one man. For one year this makes a sum of sixty-two and a half days. Allowing $1.25 per day for board and wages, which is a low average for the year, we have an amount that would go far in supplying conveniences for the kitchen; then multiply this by the years that this waste goes on and all will be convinced that it is better to begin right. Not the least thing to be considered in this useless waste, is the youth, strength and health of the wife.

It is bad economy to do without anything that will expedite or make easier the labors of this department. Be satisfied with nothing but a good stove or range with reservoir, and all the modern contrivances for cooking. A good washing-machine, wringer, nickle-plated smoothing-irons and fluter are necessary for the laundry. Have the wood-box so arranged that it can be filled from the wood-shed, which should always be supplied with good wood.* Let the well and cistern be conveniently near, and on a level with the floor if practicable. The pantry should be large enough to accomodate a cooking table supplied with drawers for spices, rolling-pin, pie-tins, etc. Near this should be kept the flour and sugar boxes, that the baking may be all prepared here, away from the stove and with as few steps as possible.

Let convenience be the ruling thought in all the arrangements of the culinary department, and

LET PURITY BE THE LAW.

No amount of show and pretence in the front part of the house can conceal bad house-keeping here. Mouldy cupboards will send their little messengers on the air to whisper the secret to visitors the moment they enter the house. Sour or decaying vegetables may be out of sight, but their presence is none the less certain when their offensive smells are floating through every room.

The habit of boiling cabbage and turnips and pork, and frying onions and burning the roast and a multitude of other scent-distributing practices of the carless

*This latter is a very convenient arrangement and saves both labor and dirt. The wood-shed must, of course, adjoin the kitchen; a hole is cut through the wall, and the wood-box built in with a portion extending into the wood-shed. A tight lid over the part in the wood-shed prevents cold air from drawing through. R. S.. T.

house-keeper, with the doors leading to the other rooms all open, is perfectly incompatible with pure air in the house. These scents gather strength by age, and on entering some dwellings you are met by a combination of all in one disgusting odor. While the lady meets you with a self-satisfied air perfectly surprising to you. You wonder she is not throwing open the windows and scattering disnifectants. She has, in fact, become so inured to breathing this vitiated atmosphere that she is wholly unconscious of anything wrong. She does not know that her curtains, her carpets—aye, the very walls about her, and her own clothing, are all saturated with and giving of this compound effluvium.

Always have the cook-room well ventilated and the doors closed between that and the rest of the house.*

While we are treating of this disagreeable subject of unpleasant odors, another presents itself more inexcusable, more utterly loathsome and intolerable, than all other:—Personal uncleanliness.

Some say cleanliness is *next* to godliness. We think godliness would have a better chance to work on the heart of a clean man that a filthy one; therefore, we say to the philanthropist—buy soap, and build plenty of bath-houses, and your work for the sins of men will be blessed with a more abundant harvest.

The practice of wearing the same underclothing, night

*The organ of smell was given to us partly that we might enjoy the fragrance of flowers, but largely as a protection. A bad smell is always the sign of impurity, and impurity is the advance guard of disease and death. The only proper smell about home or person is no smell at all, and we should keep our noses trained by pure associations so that they will be ever ready to give warning of the impure. Pure air and plenty of it and sunlight and cleanliness are the best disinfectants. If after a day spent in the pure air of the fields on entering the house you notice a stale odor hanging to the rooms, be sure there is something unclean there. R. S. T.

and day, for two weeks, without giving the body a single ablution in the time, must result in—to use the mildest term—concentrated impurity. The body continually throwing off through the pores the offensive exhalations of the system, at the rate of a pound a day, is loading the clothing with these fetid odors; and if they are given no chance to escape, by change at night, the accumulation must be absorbed, exhaled and reabsorbed until clothing and person become mutual contaminators, and both an offence in the nostrils of good society,

The farm home should be the best home; therefore, let every country home be provided with a bath-room, and every child be taught, from baby-hood, that common decency demands personal cleanliness.

THE SLEEPING ROOMS

though last mentioned, are not less important in their offices and arrangement than those preceding them. As the arrangement of one will apply to all in the main, we will speak more particularly of the guest chamber. If economy must be exercised in the furnishing, a small amount of money can be made to go farther in appearances here, than anywhere else in the home. So many pretty things are quite inexpensive, and so many conveniences can be made that cost little more than one's time, that bed-rooms need never be destitute of ornamental toilet articles and foamy draperies of lace or mull, which are always lovely in their purity if they *are* cheap.

If there is abundant means, of course elegant bedroom sets will take the place of the common articles, and curtains and lambrequins will supplant the cheap draperies; but in either case the most essential thing in furnishing a guest chamber is to provide for *every possible need* of your guest.

Mrs. M. C. Holbridge, of La Salle County, Illinois, in an essay on the "Duties of Hostess on a Farm," says:

> No matter how poor or how barren of luxury a home may be, a woman of taste and energy will manage to provide the necessities of a bed chamber. She will make a toilet table of a dry goods box and an old sheet. She will sell rags and buy a tin wash-basin and an old pitcher to go with it. She will take in washing or make shirts to get means to provide a twenty cent looking-glass, a comb, brush, soap and towels.

Often a guest is conducted to a room with the single provision for comfort—a bed—softened, however, by the soothing assurance that when they get able they are going to furnish the room nicely. Feeling that the dust and cinders and general moil of travel are clinging to her garments and person, she must violate her innate sense of propriety by retiring unwashed; and in the morning, with every nerve tingling at the outrage, she must don her "other dress," with its soft delicate laces to be soiled by the process, and go down to finish her toilet as best she can at the back door, in presence of the family, taking turns with them in washing, combing, etc. We speak plainly of this matter not that we love the careless ones less but that we love their rank as "country people" more, and labor in all kindness to do them good.*

ART IN HOUSE-KEEPING,

There is no department of labor where there is a wider range for the display of artistic taste than in house-keeping. Some regard house-keeping as but a

*Mrs. Aldrich speaks of the guest chamber, but if the boys and girls of country houses are to be brought up so as to appreciate the comforts of refined living, the same conveniences should be in their rooms. It is a mistake made by some to imagine that home folks can get along any way. If you want the "home folks" when grown up to feel at ease in the houses of others you need to accustom them to such living at home. R. S. T.

monotonous and continuous round of drudgery. Such never comprehend the great possibilities of enjoyment in home life. Their hearts never feel the thrill of rapture that comes from giving pleasure to others. If the linen for the family is weekly prepared, the necessary amount of cooking done to gratify the demands of nature, the regular scrubbing performed in a vigorous manner, and all the other *hard* work that can be conjured up finished, they think that this is all there is of life. If only we could rub the scales off such peoples eyes, and get them to realize that God gives us all the bright and beautiful things of creation with the blessed privilege of combining them to make our own paradise!

If through all the worlds history each couple, as fast as they were paired, had been placed in a garden of Eden, the race would never have arrived at its present state of perfection in the arts and sciences. There would have been no incentive to develop the latent powers of mind, and woman could never have enjoyed her highest honor, that of *making a home*, for it is really and truly a creation of hers.

We enter some homes where we feel that an air of elegance prevades everything, and wonder how people of *their means* can afford such extravagance, and begin slyly to examine and analyze our surroundings; and very often we find that what at first sight impressed us as the beauties of fairy land, are but the ingenious combinations and formations of an artistic taste aided by very limited means. And often we enter houses of the wealthy expecting to be blessed with the sight of rare beauty and costly adornings; but, instead, the nerves are kept in a constant quiver by the shocking glare and contrast of colors, and the entire inharmony of every object with its neighbor.

Every thing in a house—the color of the wall paper, the curtains, the carpets, the arrangement of every article from the books on the table to the adjustment of the furniture—conduce to please or discomfort the inmates. We do not always realize how much little things have to do with our happiness.

A just conception of the "eternal fitness of things" gives a systematic whole that charms and pleases the beholder. This may be found in the homes of the poor as well as those of the rich. It consists in the appropriating and harmonizing of the materials which are strewn around every country home.

What a blessing to the toiling millions that all the beauty and happiness are not shut up in the parlors of the wealthy.

The tired mother may say that she has not time to study the artistic arrangement of things in reference to shape, color etc. Let her set the little girls at the lighter parts of work and they will very soon learn what colors look prettiest together, when once their minds are directed to the subject. Even a dish of fruit on the table in the dining room may be arranged to be "a thing of beauty." A white fringed doily laid on a bright spread, and the fruit dish set on this heaped with shiny golden, red and green apples laid in with studied care in reference to color, combined with other fruits in their season, peaches, pears, and some luscious clusters of grapes, make as nice an ornament as a costly basket of wax fruits. But let the mind once turn to this matter and harmony will seem to come intuitively.

A small outlay in ivies adds a grace to windows and arched door-ways as nothing else can. The fragrance of a heliotrope, a bunch of sweet violets, or a box of mignonette, gives to a room an ambrosial atmosphere

and charms the senses with their sweet odors. All these and a thousand other little things are but atoms considered apart, but it is their *sum* that makes up the delightfully pleasant country home.

WOMAN'S WORK ON THE FARM.

BY A LADY FRIEND.

There is scarcely any other occupation where the work of husband and wife run so nearly on the same line as in that of the farmer, and there should be that oneness of purpose that gives perfect harmony. Where such a state of feeling exists, each will be anxious to lighten the burdens of the other.

As it is the province of the farmer to look after the details of his farm, so should his "help-meet" look well to the ways of her household, eating not the bread of idleness. He cultivates the ground, and from its abundant fullness she is provided with the fine wheat and corn, his flocks ard herds supply the meat, his well fed cows the milk, his garden and orchard the vegetables and fruits. It is hers to make such use of these luxuries that her table shall be furnished with well cooked food, and the surplus so carefully looked after that nothing shall be lost or wasted. It is quite an art to gather up the remnants and present them in new form. By remnants we do not of course mean the bits left upon the plates. The bones from a roast, cracked and boiled, will, with the addition of vegetables and flavoring, make a delicious soup. The meat that can be trimmed off after it it has done duty as a roast, may be hashed and heated up, with gravy poured over toast, and you have a nice breakfast dish. Remnants of veal or chicken used in

croquetts or salads are frequently more relished than when first prepared for the table. Every housekeeper should study how she can use to the best advantage all the odds and ends, both of provisions and clothing. The waste in some families would make a handsome living for others.

As woman's domain is the home, her highest aim should be to make it a home in the best sense of the word, the place above all others that husband and children will love and cherish. She may not have the skill or the means to make it a bower of beauty, but by making the best use of means at her command, she can make it an abode of comfort. Her supervision should be from garret to cellar; order and cleanliness should reign throughout. She must see that each bed is provided with comfortable clothing, and that all the rooms are daily thrown open for the admission of heaven's free air and sweet sunshine. The clothing of the family is an important consideration. Suitable changes for the seasons must be provided, and they must be ready when needed. The diet of the family should be most carefully studied. A pleasing variety arranged for from day to day, and such articles selected as are wholesome and best suited to their varied needs. There is no one article so essential to the comfort of a family as good bread, and no housekeeper should be satisfied until she has attained the art of making it. The ability to make good butter is another accomplishment that every farmer's wife should possess, and in these days when so much is written on the subject, and there are so many opportunities for learning how it is done, there can be no excuse for ignorance in this branch of woman's work.

Perhaps there might come up the much discussed question, Is it woman's work to milk? In general I

would say no. Her sphere is the house, and here she can find employment for all her time.

While woman should study in every way to lighten her burdens, she should try to do everything well. "Work well done is twice done" is a maxim the truth of which is often verified in our own experience. A systematic arrangement of work, giving the most important duties the first place on the list, is a great help; and there is perhaps no better way to make our burdens easy to bear that to cultivate a spirit of cheerfulness. The moral influence of such a spirit in the household is of priceless value, and if it entered into our every day duties how much that we now count monotonous drudgery might become a source of positive pleasure.

In these days it is possible in most of our farming communities to hire help, and it is mistaken economy for the wife to overtax her strength by trying to do everything herself. If means are wanting to pay the added expense of a house-servant, let her try her ingenuity by devising some way of increasing the income. The husband might add one or two cows to his herd, the wife enlarge her flock of poultry and give it better care, or cultivate some of the small fruits and sell in the neighboring markets. In this way she may take recreation in the open air and add to her health and good spirits as well as to the contents of her purse.

Perhaps the most important part of woman's work is training the children. In infancy they are her especial charge; as they develop into restless childhood they must be carefully watched, that evil does not creep in. Employment must be given, and that of a useful kind is usually the most entertaining. A spirit of helpfulness should be early encouraged. For the present it will doubtless seem easier for the mother to perform the

prescribed tasks, but in this she is educating her child, and the benefit to her will come perhaps after many days. No matter how many servants are kept, she should regard it as a religious duty to teach her daughters habits of industry and economy, and to train them in all that pertains to good housewifery. The sons, too, should be taught habits of order and a due consideration for the comforts of others. In this way they will be fitted for making pleasant homes of their own and saved from the trials and disappointments that will come to those who have not been thus fortunate in their training.

From the mother naturally comes the moral and refining influences, and her own words and conduct should be so carefully guarded that the children shall learn from her example lessons of purity that shall enoble their characters, refine their manners, and fit them for usefulness. "Then shall her children rise up and call her blessed; her husband also, and he praiseth her."

NUMBER OF PLANTS TO AN ACRE.

2	by 1	 21,780	5	by 3	 2,904	14	by 14	 222
2½	by 1	 17,424	5	by 4	 2,178	15	by 15	 193
2½	by 2	 8,712	5	by 5	 1,741	16	by 16	 170
3	by 2	 7,200	6	by 6	 1,220	16½	by 16½	 160
3	by 2½	 5,808	6½	by 6½	 1,031	17	by 17	 150
3	by 3	 4,840	7	by 7	 888	18	by 18	 134
4	by 1	 10,890	8	by 8	 680	19	by 19	 120
4	by 2	 5,445	9	by 9	 537	20	by 20	 108
4	by 3	 3,630	10	by 10	 436	25	by 25	 60
4	by 4	 2,722	11	by 11	 360	30	by 30	 48
5	by 1	 8,712	12	by 12	 302	33	by 33	 40
5	by 2	 4,356	13	by 13	 257			

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